The Heating and Ventilating Magazine

A Monthly Journal of Engineering Progress

OCTOBER, 1925

Meeting Unusual Requirements in a Lodge Building

Successful Design Calling for Ventilation by Displacement, with Separate Equipment for Different Departments

By Samuel R. Lewis
Consulting Engineer

(The reasons for the adoption of central station heating service in this building, with detailed figures of the savings effected thereby, were presented in last month's issue.)

IN the design of the equipment for the Springfield (O.) Masonic Temple, a few fundamental provisions are:

1. Every ventilated room shall have both supply and exhaust.

2. The air passage shall be as far as practicable of the cross type, from bottom to top or from side to side—an attempt to get ventilation by displacement, rather than ventilation by diffusion.

3. The various departments shall be separated to as great an extent as practicable, so that any rooms or physical divisions which may happen to be unoccupied may be cut off completely and need not be ventilated, even though fans may be operated for occupied departments served by fans common to both.

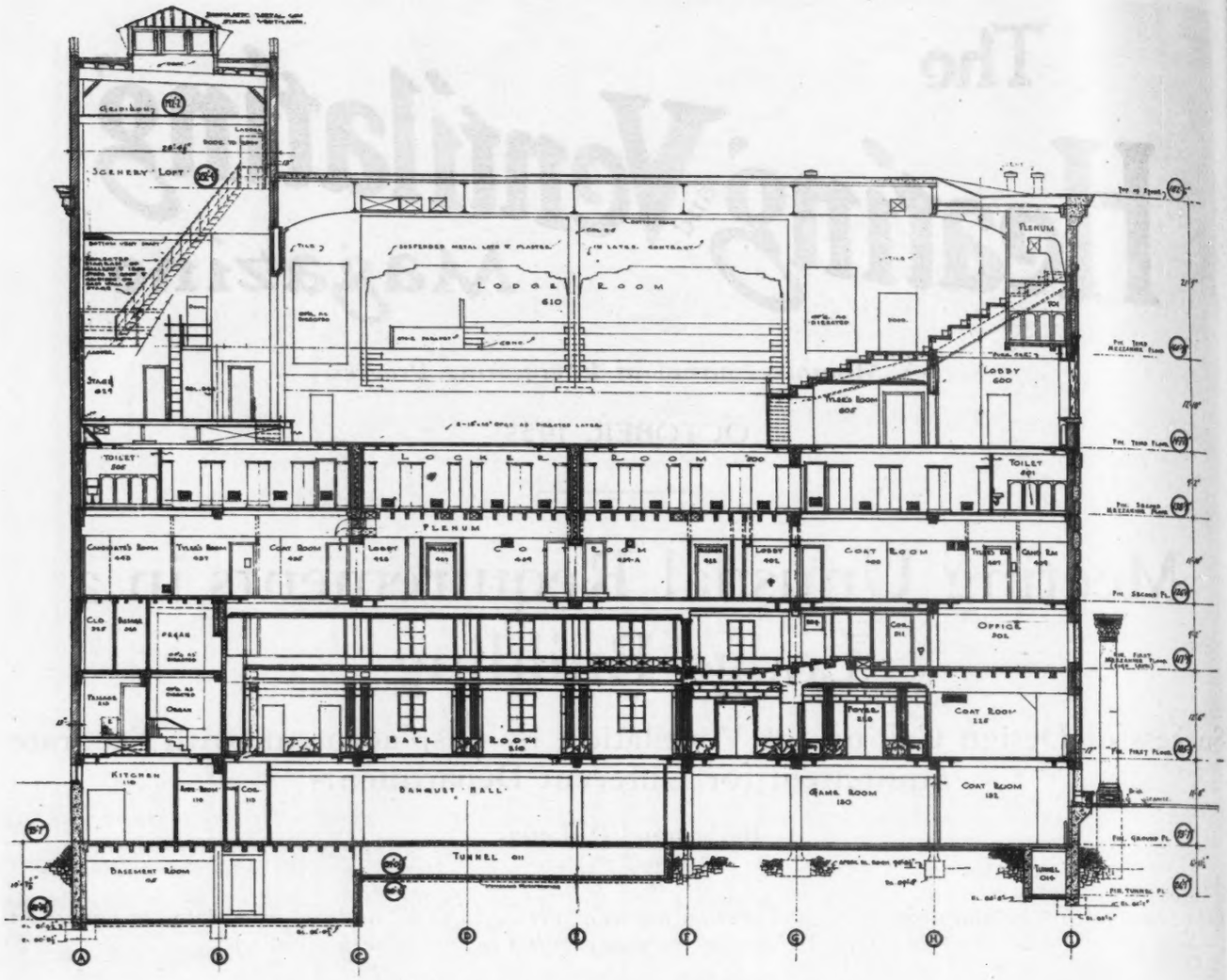
TWO-PIPE VACUUM HEATING SYSTEM INSTALLED

The heating is by direct radiation, under automatic temperature control. The radiators are suspended, and the risers usually are concealed. Since the atmospheric system of steam circulation without return of condensation to the central station, recommended by the public service company, involves some question of freezing with large indirect radiators in contact with fan-blown cold air, and since double automatic temperature-control valves and larger pipe sizes would be required with atmospheric circulation, it was decided that a standard two-pipe vacuum system with an electric vacuum pump would be justified. The warm water discharged by this pump is passed through economizing radiators on its way to the sewer, and the amount of original direct radiation is in consequence not increased by the customary percentage as for ordinary atmospheric heating. The cost of running the pump is trifling, and the advantages in quick circulation, efficient automatic temperature regulation and freedom from freeze-ups justify the addition.

ARRANGEMENT OF FRESH-AIR SUPPLY APPARATUS TO SECURE EASY ACCESS, ISOLATION FOR SOUND AND ECONOMY OF INSTALLATION

The fresh-air supply apparatus occupies the southeast corner of the building, on all stories, and is thus susceptible of better access, isolation for sound and economy of installation than if placed in the basement or attic or scattered over the various floors.

The basement supply equipment, consisting of a concrete air washer with glass eliminators, tempering heaters and electric-driven fan, delivers fresh air to the ground story and to the offices, check rooms, corridors, toilets, etc., serving those departments which we may call the "club" activities and which are in use nearly all of the time.



Longitudinal Section, Springfield Masonic Temple

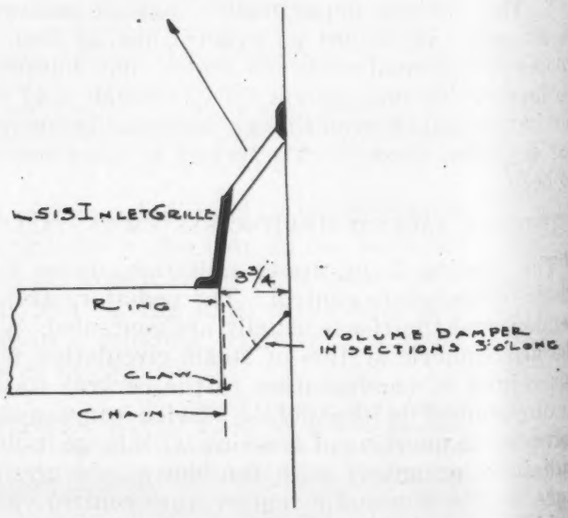
The air is delivered through 5 ft. by 6 ft. masonry tunnels along the outer walls, which carry also steam and return pipes, electric services, etc., and which are clean, well-lighted service passages. The periphery of the building is paralleled by these tunnels, about half of which are supply ducts and the remainder, vent ducts.

The vent ducts lead at the southwest corner to the exhaust fan which corresponds to the club supply fan, and which discharge through a metal flue to the roof. Thus that part of the building having the highest use-factor has its fans and ducts right at hand.

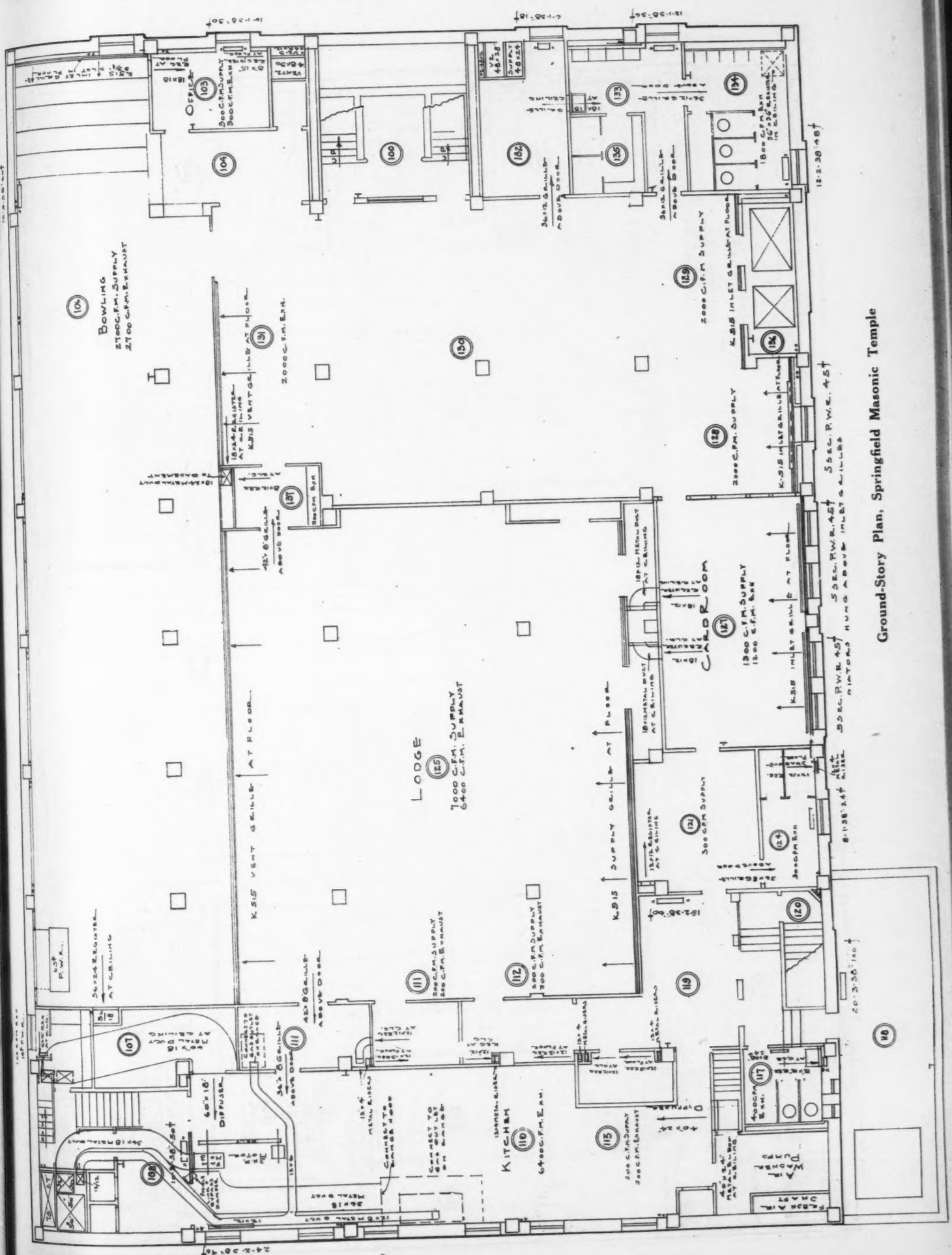
The building has no basement. The ground floor is all finished and all used. No ceiling ducts or pipes to any great extent could be tolerated. It became easy, having these tunnels, however, to design effective cross-ventilation for the ground-story rooms.

NOVEL DEVICES USED IN PLACE OF CONVENTIONAL METAL RISERS AND GRILLES

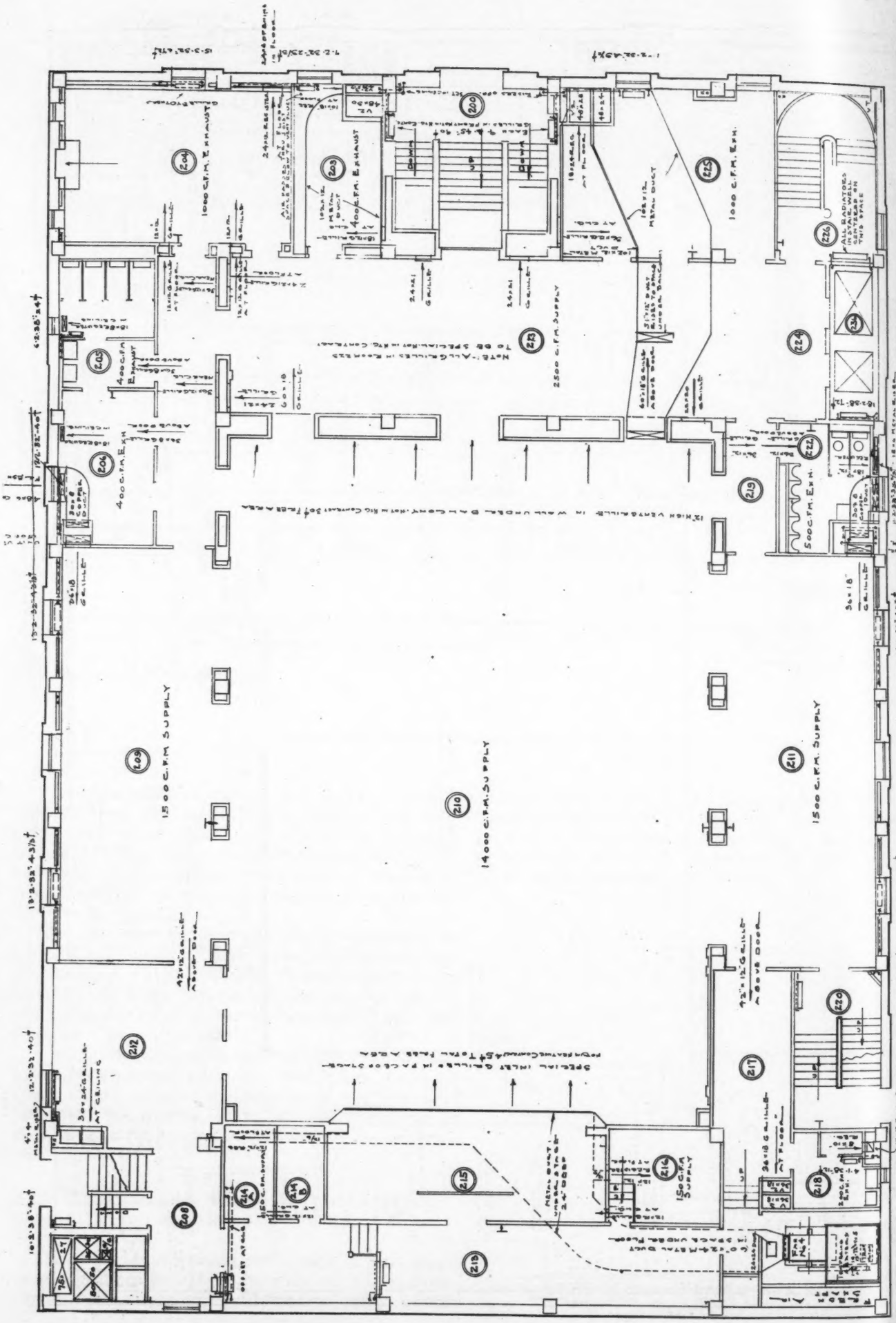
Two individual devices were used in this plant to a considerable extent in place of the conventional metal risers and grilles. One, called for its pattern number, K-515, is a slanting cast-iron baseboard having a 4-in. wide grillage looking up, and passing air in a stream resembling a flat jet, the entire width of a room if desired, in such manner as to permit considerable velocity.



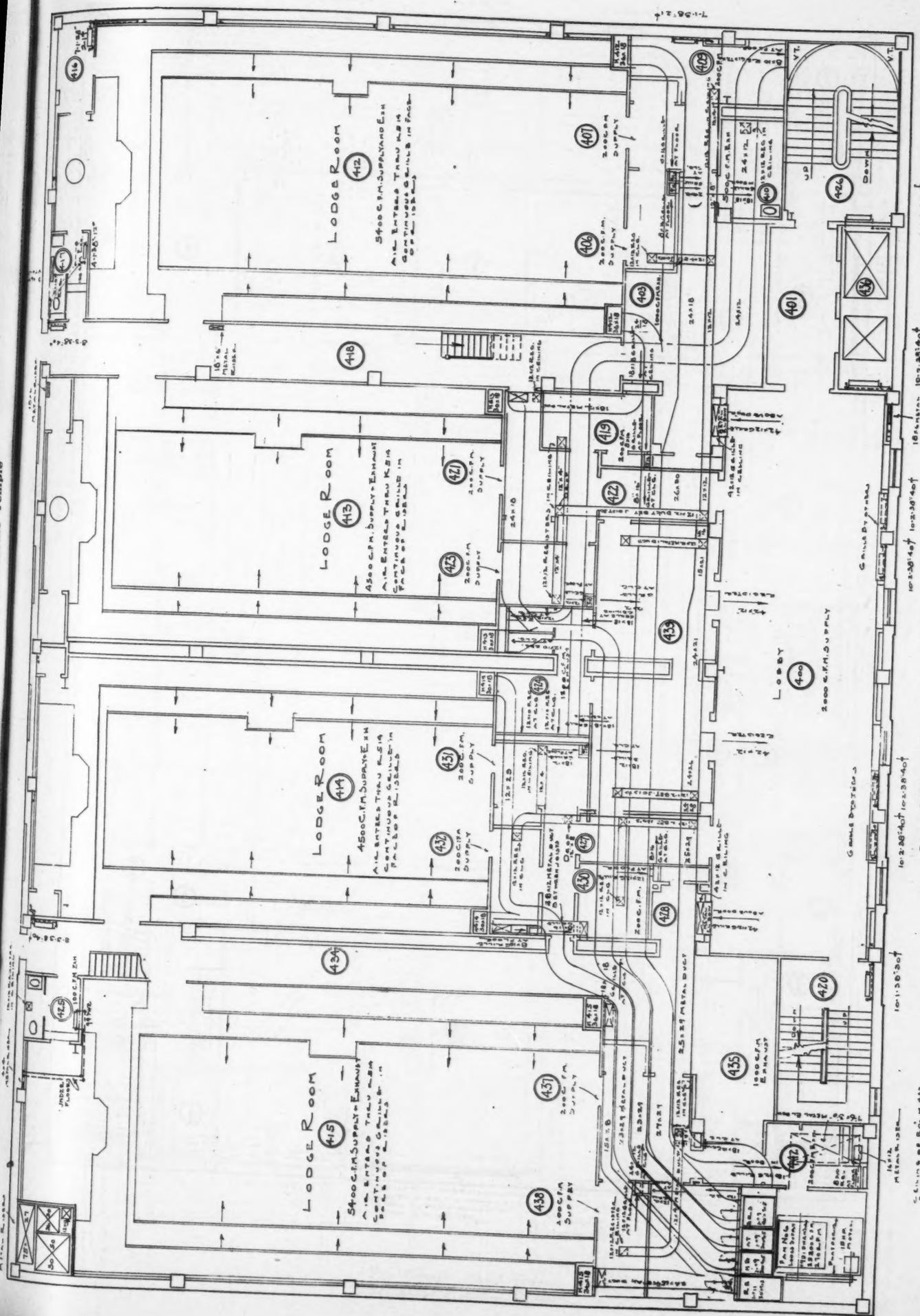
Typical Detail Showing Damper for K 515 Grille, Ground-Story



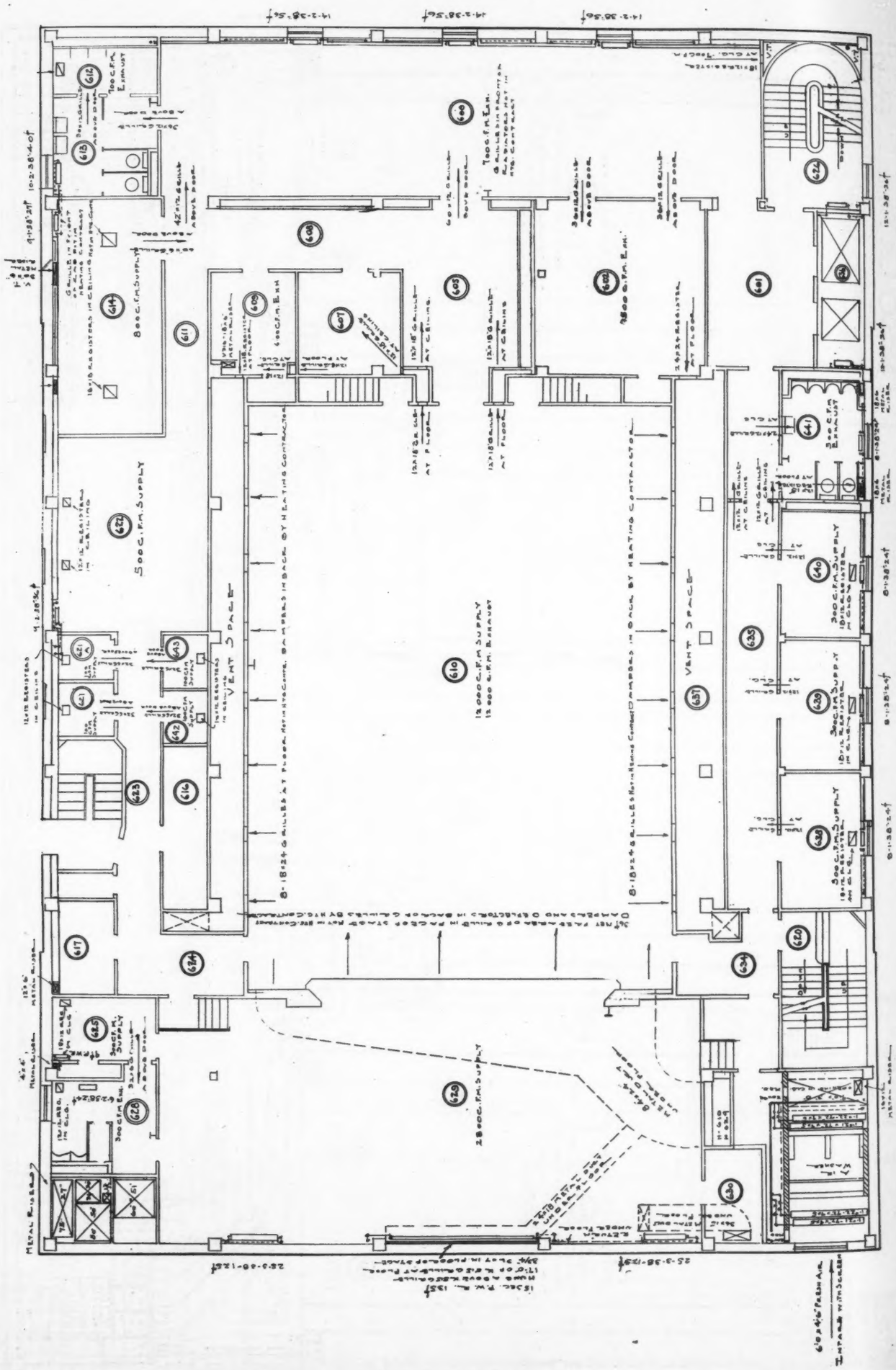
Ground-Story Plan, Springfield Masonic Temple



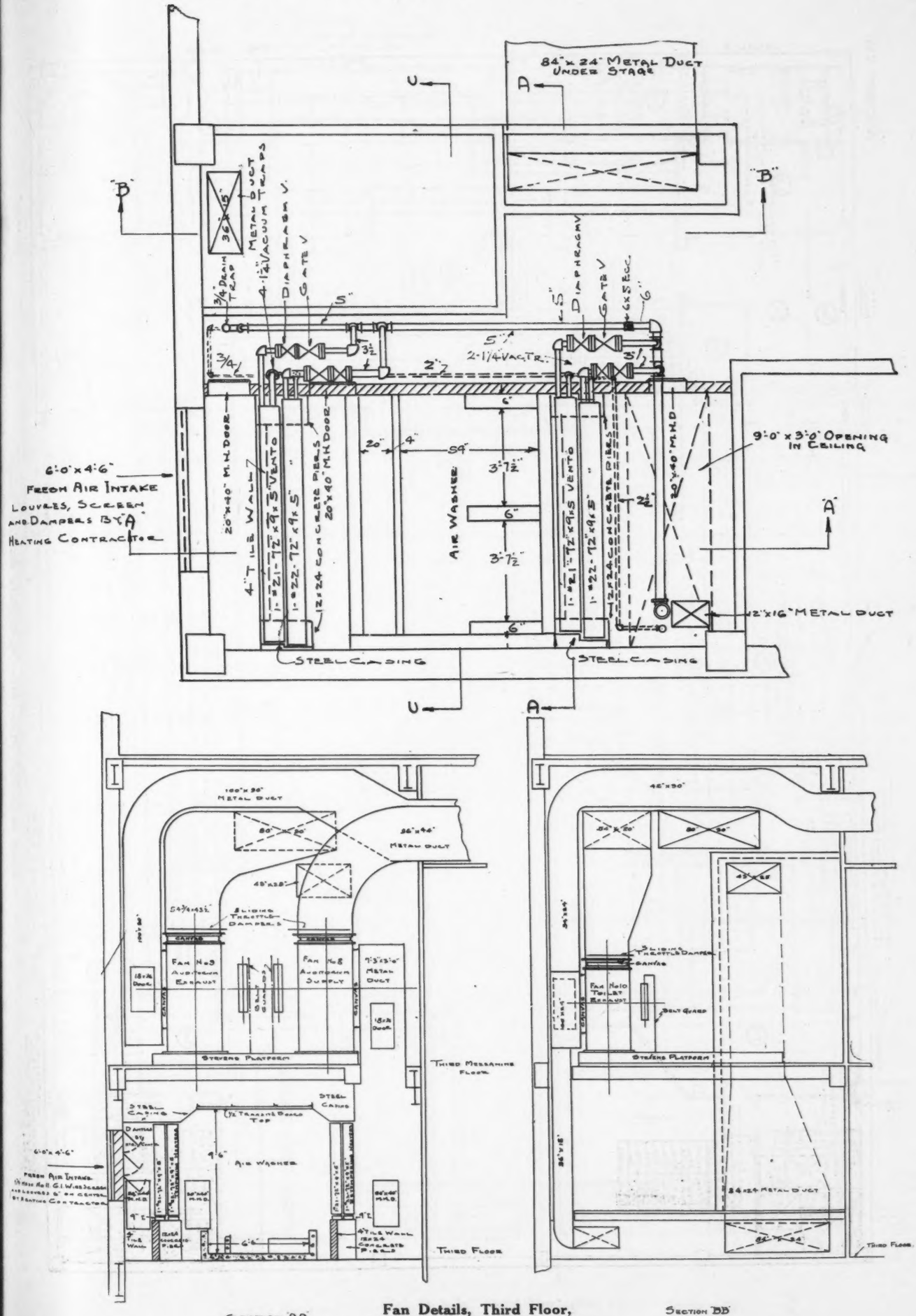
First-Floor Plan, Springfield Masonic Temple



Second-Floor Plan, Springfield Masonic Temple

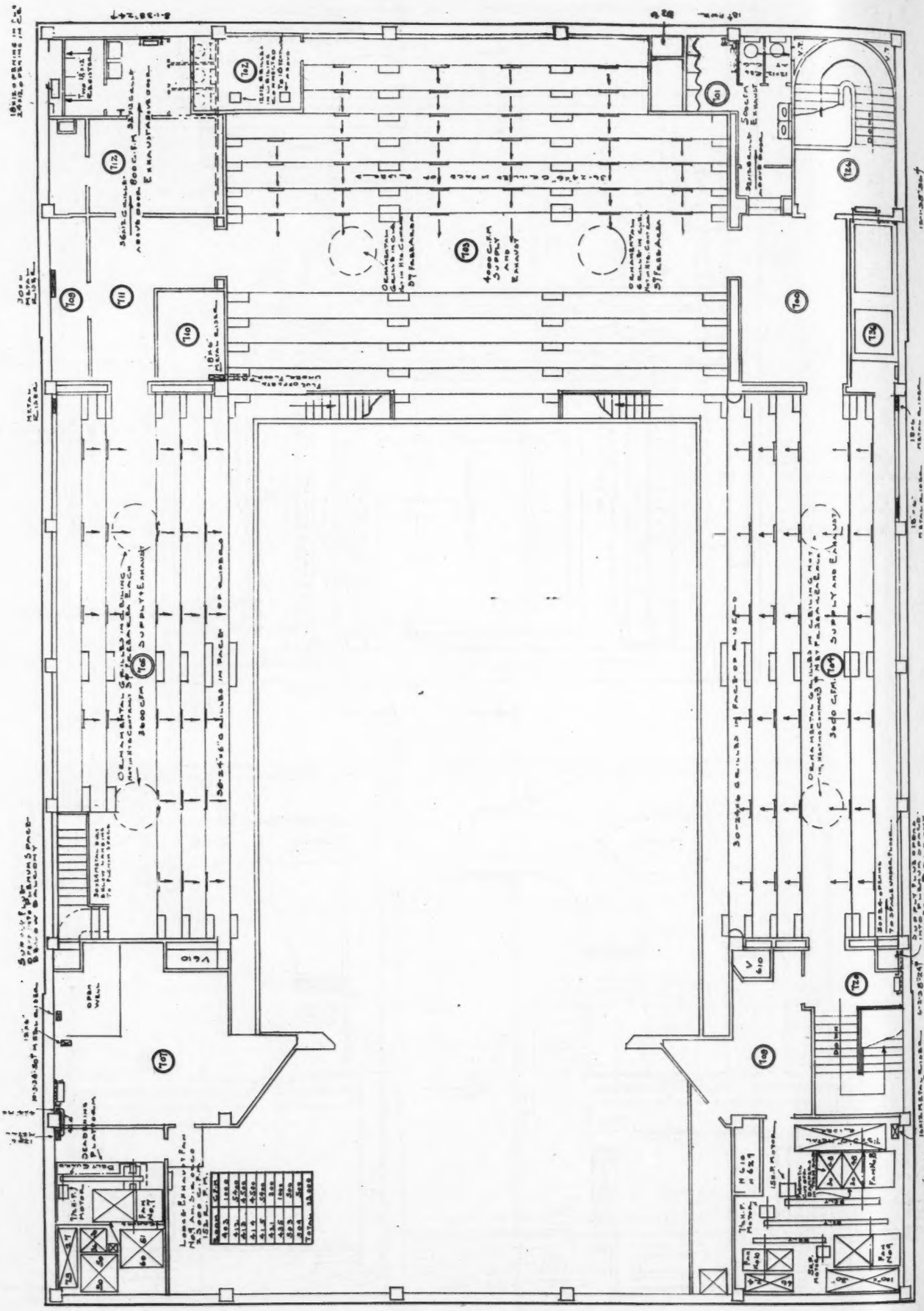


Third-Floor Plan, Springfield Masonic Temple

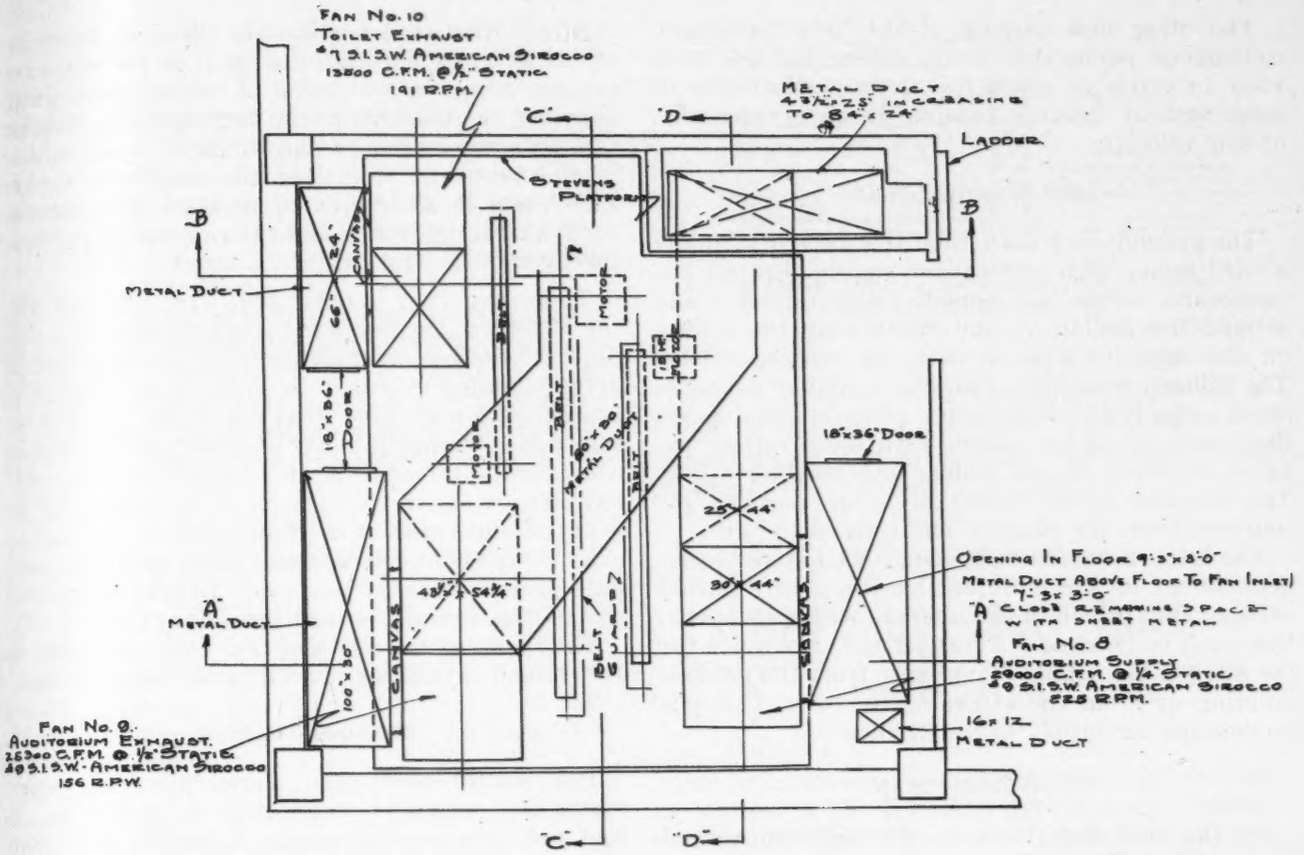


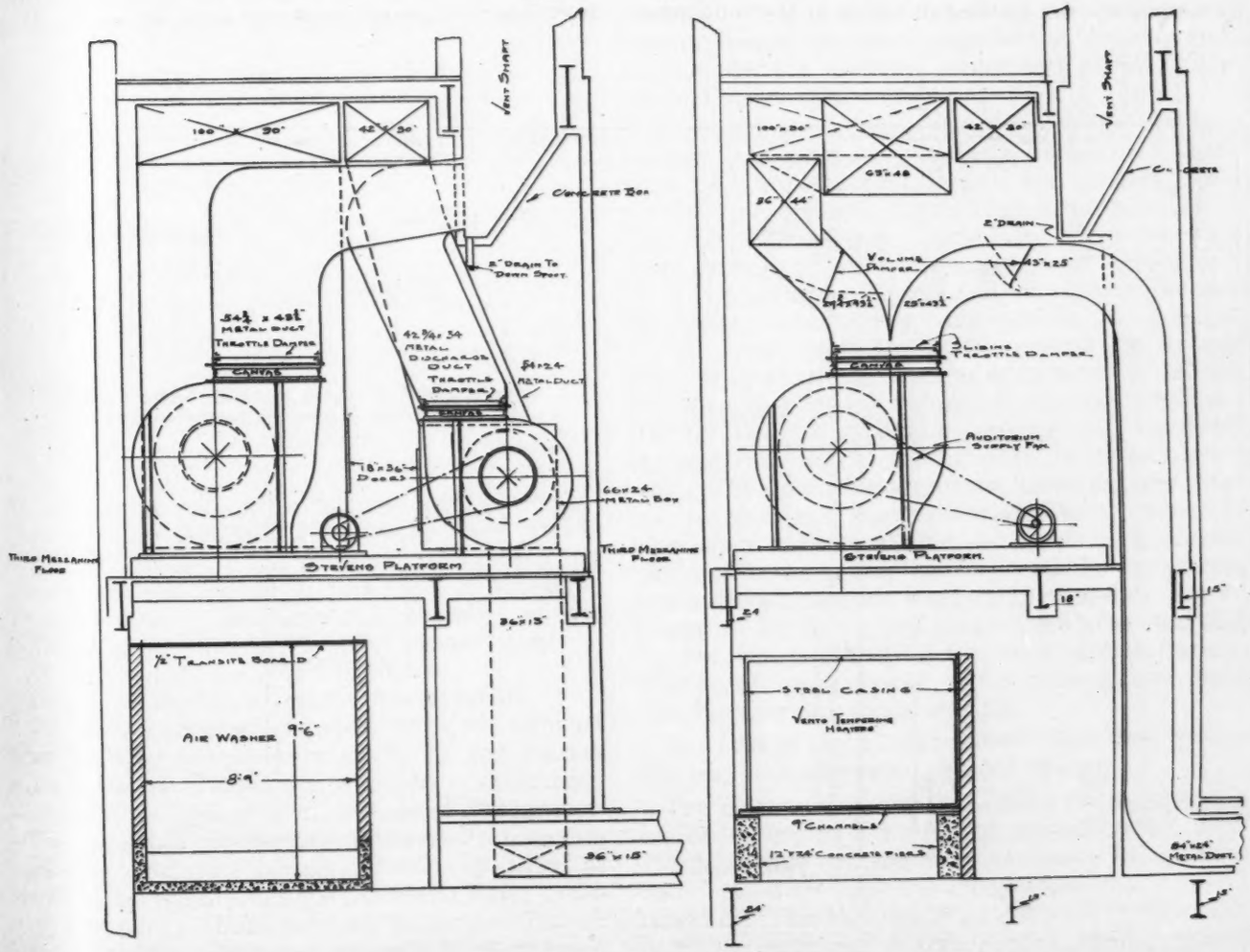
Fan Details, Third Floor, Springfield Masonic Temple

925 Third-Floor Plan, Springfield Masonic Temple



Third Mezzanine Floor Plan, Springfield Masonic Temple





SECTION "CC" ¼"-1'-0"

Fan Details, Third Mezzanine Floor, Springfield Masonic Temple

SECTION DD ¼"-1'-0"

The other new casting, K-514, is a tee-shaped continuous perforated metal device for use as a riser in stairs or along the elevated platforms of lodge halls or theatres, passing the air horizontally, at low velocity.

GROUND-STORY PLAN

The ground-story plan, then, discloses principally a card room, with vertical air supply through the baseboard along the outside walls, behind and around the radiators, and vents near the ceiling on the opposite side, to care for tobacco smoke. The billiard room, No. 130, has a similar arrangement, using K-515 floor supply at one end and K-515 floor exhaust at the other, with some ceiling exhaust to check rooms, toilets and bowling alleys. The bowling alleys have the same positive air journey, from the players' end toward the pits.

The kitchen, which may upon occasion serve any department of the building, has its own separate exhaust fan, placed in the kitchen, where its operation shall be checked. Arrangements are made for the kitchen air supply by exhaust from the general building or from the kitchen windows. There is no positive air supply to the kitchen.

FIRST-STORY PLAN

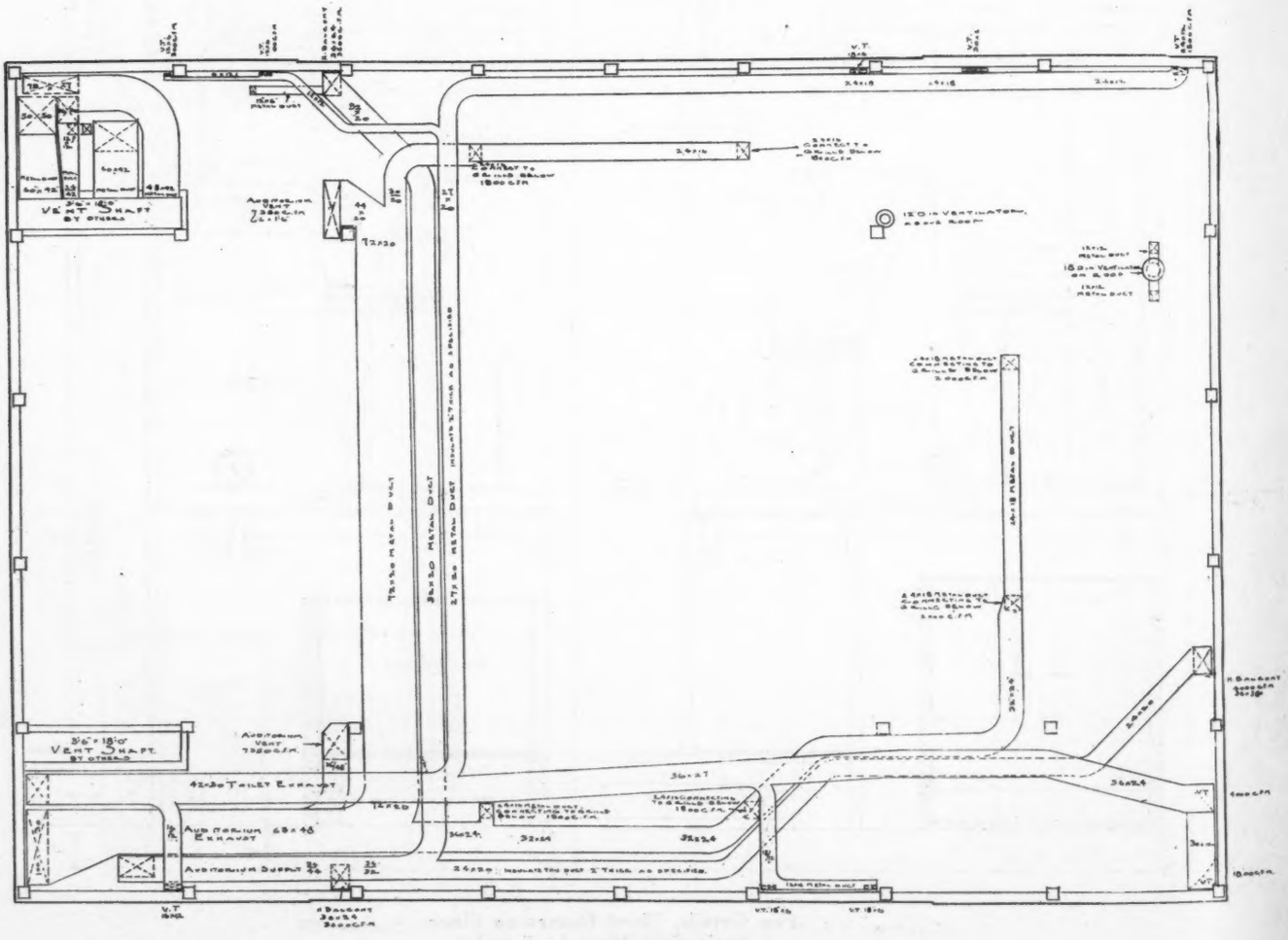
On the first story we have the ballroom, served by a separate fan in the fan-tower at the southwest corner, with a super-imposed air washer, delivering air at an angle through the front of the stage and venting at the opposite end of the ballroom, under and over the balcony, to the corresponding exhaust fan, located, owing to exigencies of construction, in the basement tunnel at the southwest corner. This room is also often to be used as a banquet room and dining room, and the ventilation is, therefore, generally upward.

There are four rooms, 209, 211, 317 and 318, the latter two on the balcony, which may be a part of the ballroom, or may be shut off and used as private dining rooms. In order that, when separated, each may have some air supply, each of the four has at its north end a separate unit ventilator, controlled automatically and started by a separate tumbler switch in each room. The exhaust of air is at the south ends of the four rooms to the kitchen exhaust fans via the serving pantries and special flues provided for the purpose. To care for tobacco smoke, the vents are near the ceilings.

The rooms at the north of the two-story ballroom are club-office utilities, served by the basement fans.

SECOND-STORY PLAN

The second-story plan shows the four lodge rooms, any or all of which may be in service. It was not practicable, though it would have been desirable, to furnish separate fans for each. The



Attic Floor Plan, Springfield Masonic Temple

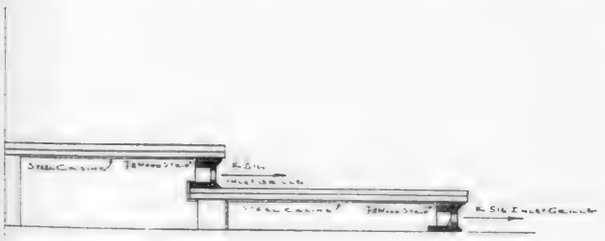
four, therefore, have one supply fan, with its air washer above it, but with separate ducts, dampers and reheaters, so that by a very simple interlocked pneumatic arrangement on a panel board, any of the lodge rooms may be cut off. All four use upward air circulation, the air entering through the step-risers and leaving at the ceiling at the west ends, whence it goes to the lodge exhaust fan, placed in the attic fan room, since there was insufficient room for this fan on the second story.

The second mezzanine plan shows the lodge room vent ducts and the locker room. The locker room may serve in connection with any department of the building. It has, therefore, two unit ventilators for supply, and the ventilation passes at the end of each locker aisle to a duct which leads to the toilet exhaust fan.

THIRD-STORY PLAN, COMPRISING AUDITORIUM

Third Story: This is the auditorium, without any windows, and requiring a fairly large volume of fresh air (12,000 cu. ft. per minute). It may be used for smoking. The main floor may be a drill hall or may have a seated audience. Upward ventilation is provided.

The supply fan is at the southeast corner, with its washer under it. Air for the arena floor, which is flat, enters in the face of the stage and is exhausted around the other three sides, at the floor.



Typical Section Through Steps in Lodge Rooms, Second-Floor Plan, Showing K 516 Inlet Grille

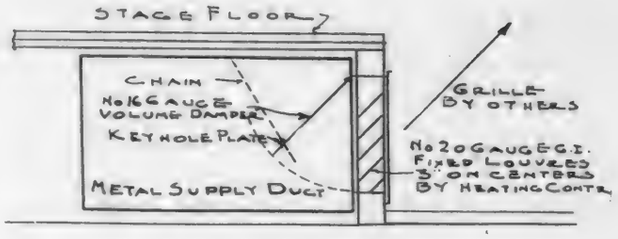
Air for the permanent seats, forming the amphitheatre, enters through grilles in the risers and is exhausted through eight grilles in the ceiling, by the exhaust fan which, in this case, is alongside the supply fan. The same fan chamber at the southeast corner houses the toilet exhaust fan.

All attic supply ducts are insulated.

The air washers are omitted temporarily.

The outlets through the roof, from the exhaust fans, are open-top masonry shafts having gutters at their bases. These interpose less friction than do ventilators, and give an improved appearance.

The fans and motors are all carried on sound-deadening platforms floated on felt-lined chairs, as furnished by the Stevens Partition and Floor Deadener Company. Fans are of American Blower Company make. Motors are made by Robbins & Myers, of Springfield. Johnson automatic temperature regulation is installed.


STAGE FLOOR
CHAIN
No 16 GAUGE VOLUME DAMPER
KEY HOLE PLATE
METAL SUPPLY DUCT
GRILLE BY OTHERS
No 20 GAUGE G.I. FIXED LOUVRES 3" ON CENTERS BY HEATING CONTR.

Typical Detail Showing Air Supply Inlet to Rooms 210 and 610, First-Floor Plan

Howard Dwight Smith and Miller & Reeves of Columbus, O., are the associated architects.

The heating and ventilating contractor is the Huffman-Wolfe Company, of Columbus.

How They Save Fuel in Kansas

Due to a transposition of the types, the concluding section of Mr. Kitchen's article in the September issue on "How They Save Fuel in Kansas," was omitted. This article described an interesting combination of direct-transmission air heaters and steam boiler for heating a junior high school building in Kansas City.

It should have been stated that the heating equipment, fans, motors, vacuum pump, heat regulation, air compressor, all switches, gauges, etc., for the Leavenworth Junior High School, in Leavenworth, Kansas, are located in one apparatus room, which, in turn, is located near the center of the building. This is an ideal location for equidistant distribution and ability to equalize the air delivered to the various rooms (in testing this job it was found necessary to move or adjust less than 25% of the volume dampers). The central location of apparatus necessitates, however, the handling of coal and ashes by truck on a runway. The operating engineer, however, says that this involves but slight additional labor, which is more than compensated for by the ease in operating, due to the concentration of all the apparatus. During most extreme weather the building can be heated to 70° F. in two hours' time after starting the fire, which illustrates the value of direct transmission of heat, instead of the indirect and more circuitous route via steam coils.

The cost of the plant as above described is usually less than all steam or split system.

The direct transmission heaters in this building are operating at a saving of approximately 16% over the steam-coil system in its Senior High School building. Both jobs were engineered by John R. Kitchen. The building was designed by Charles A. Smith, architect, of Kansas City, through whose courtesy the illustrations in last month's issue were presented.

Oil Burning Boilers—Their Design and Characteristics

What is Available To-Day, and What the Future Promises, in Economical Equipment for House Heating With Oil Fuel

THE tremendously rapid development of the domestic oil burner industry during the past two years has apparently caught the boiler and furnace manufacturers asleep. Twelve months ago, a New York executive, building a large home in a Long Island suburb, purchased a heating boiler. As several of his friends had used oil burners during the previous winter, and their reports had been uniformly satisfactory, this man decided that he would burn oil. He was able to make personal contact with the engineering department of the company manufacturing the boiler he had bought, and he asked them to recommend an oil burner. The reply was, that the company would not recommend any particular oil burner, or even speak encouragingly of oil burners in general. In fact, they spoke pretty disparagingly about oil burners. This man told me last week that he had just called again at the office of the same boiler manufacturer, and was told that they recommended the ———— burner very highly. This burner has been on the market for many years, and has not been materially changed in the past two years.

Thus, in twelve months, this manufacturer has completely changed his attitude. Now, what was the reason for this change? Was it an engineering reason, or based on commercial expediency? Looking over the field of boilers presented to-day as applicable to oil burners, one is almost forced to the conclusion that commercial considerations dominate the situation.

IS THE "OIL BURNING BOILER" DESIGNED TO BURN OIL?

We find several boilers offered for sale bearing the name "Oil Burning Boilers." Are these boilers really designed to get the best results from the use of an oil burner, or are they merely the old coal-burning boilers with a new front plate, bearing the words "Oil Burner," and put out thus to fill the demand created by the rapidly growing use of oil fuel? It is truly remarkable how little specific engineering information can be secured from boiler manufacturers as to just how, and in what wise, their boilers are particularly adapted to the use of oil. The engineer of one company, when asked what was the proportion of direct to indirect heating surface replied, with a shrug of his shoulders, "fifty-fifty would about hit it."

If heating is an exact science, or anywhere near exact, such an answer does not carry much weight. The question would seem to be: "Do we, in burning oil in a household boiler, use a source of heat of the same general characteristics as we do when burning coal, or, are the methods of heat production entirely different?" In the former case, it would seem logical that the same boiler giving high efficiency with coal, would show equally high efficiency with oil. In the latter case, it would appear that with the same boiler, the two fuels could not be utilized to an equal degree. We should therefore study combustion, as produced by oil, and combustion as produced by coal, when used in a boiler or furnace for domestic use to determine the facts.

OPERATING CHARACTERISTICS OF DOMESTIC HEATING PLANTS

It must be borne in mind that operating conditions in a house-heating boiler are radically different from those in industry. A locomotive boiler, for instance, is usually doing one of two extreme things. It is either resting, banked, in a roundhouse, or it is working, wide open, on the road. The house-heating boiler is performing in almost a diametrically opposite way. It is *running banked most of the time*, and opened up wide only to meet the cold weather peaks. Thus, to compare a house-heating boiler with a locomotive boiler would be to base an argument upon an entirely falacious foundation. Again, when we speak of the use of an oil burner in a domestic boiler, we must remember that there are two distinct types of oil burners as regards their uses. There is the manually-controlled burner that operates continuously, being turned up or down according to weather conditions. There is also the "on-and-off" burner, set to function at only one rate. It is either all on, or all off. In the former condition, it is usually operated at the maximum rate of combustion possible in that boiler, and, of course, chimney conditions have little effect upon the situation because the draft is furnished and controlled entirely by a fan. Thus, the normal operation of this type of oil burner produces the equivalent power of which that boiler is capable, working under the highest rate of combustion possible with coal. A given domestic heating boiler, burning oil or coal would therefore normally operate alternately at almost the two extremes of the load-efficiency curve of the boiler.

HEAT PRODUCTION CHARACTERISTICS OF OIL FLAME AND COAL FIRE

The oil burner produces an intense yellowish-white flame largely or completely filling the com-

bustion chamber, and at a temperature of about 3800° F. If, however, in heating the same house, coal were being burned, we would find an entirely different condition. Under ordinary conditions, on an average winter day, we would find the surface of the coal black, with some red coal visible underneath the top covering, and out of the interstices would be coming little flames of gas, blue as a Bunsen burner flame. The total projected area of flame production would be much less than the area of the grate surface, and the average temperature in the combustion chamber a great deal lower than with oil. *The total heat produced,* over a long period of time by the boiler burning coal would be approximately the same as with the boiler burning oil. But, *the rate of production* of heat by each would be vastly different, owing to the fact that in one case, it would be continuous and in the other case it would be intermittent.

Does it then seem logical that the boiler designed to give best results under one of these conditions would give equally good results under the other? Yet that is exactly the basis upon which the public is asked to buy "oil-burning" boilers. Let us consider for a moment, now, the method by which heat is produced by the combustion of coal and by the combustion of oil in a typical domestic boiler. The average condition of a coal fire, we find, is a deep bed of incandescent coal with some ash below, and a covering of black coal on top. From the openings between the pieces of coal issue blue flames of a typical Bunsen type, 1, 2 or 3 in. long. If a coarse coal is being used there will not be many holes and consequently there will not be many flames. If smaller size coal is used there will probably be an increased number of flames. These blue flames will flicker constantly over the surface of the coal and while the actual temperature at the tip of one of these flames may be as high as 3200° the average temperature under the crown sheet of the boiler would be very much less than this figure. Here we have the furnace acting as a retort, gasifying the coal, and burning this gas *above* the top of the coal. The residual coke is consumed in the fire bed, transferring no small amount of radiant heat to that annular ring of the furnace immediately adjacent to the fire.

THE NEED FOR EXCESS AIR

In addition to the burning gases there may be a large amount of gas formed that does not burn, owing to the fact that not enough air can be drawn through the bed of the fire to produce complete combustion.

We thus find in a flue analysis of such a furnace, a comparatively small amount of CO_2, a large amount of CO, and in many cases considerable free carbon. It is in such a case as this that air, admitted over the surface of the fire, and under such conditions that the resulting temperature of this incoming air with the uncombusted gas with which it mixes *is well above the ignition point of this gas,* unites with the unconsumed carbon or CO and increase the efficiency of combustion. It must be borne in mind, however, that this incoming air *must not cool the gases below the point of ignition,* and *it must be thoroughly distributed* so that it will mix with the gas intimately.

HEAT TRANSFER WHEN BURNING COAL

Now there are two methods by which the heat produced in this furnace is transmitted to the water to serve a useful purpose. In the first place, the fire-box being surrounded by a water jacket, heat is transferred to the water by conduction through the iron. In the second place, the water jackets in the upper part of the furnace are heated by convection from the hot gases of combustion that are moving upward through the flue passages; but we have yet a third method of heat transfer that is often neglected and yet is of vital importance in some cases; this is by means of radiant heat. This is the form of heat that emanates from all hot bodies, travelling in line perpendicular to the surface of the body emitting the heat, at a rate of 186,000 miles per second, and obeying, in a general way, the laws that govern light waves. This heat is radiated from the red-hot coal forming the outer surface of the fire next to the furnace walls. These rays of radiant heat strike the iron surface of the firepot, and, the iron being rough and black, the radiant heat is readily absorbed by the iron, and transferred to the water through conduction. If it were a cold day and the furnace were being forced to such an extent that the top of the fire were glowing, then would radiant heat also be emitted from this surface and would travel upward and outward impinging upon all the surfaces of the boiler in the combustion chamber that *were within view of the red hot surface of the fire.* All such surfaces able to receive the impact of this radiant heat by virtue of being *within view,* so to speak, of the fire, are called direct heating surface, *but under normal conditions the surface of the fire is not luminous,* and therefore very little radiant heat is dissipated from its upper surface area.

HEAT TRANSFER WHEN BURNING OIL

On the other hand, let us consider the production of heat by a typical oil burner flame. It does not matter whether the burner be of the pot type, or of the jet type, it is a fact that a large portion of the total combustion chamber is filled with a mass of luminous flame. Although it is practically impossible to determine the amount of radiant heat that is emitted by such a flame, yet laboratory experiments would indicate that it is about ten times that emitted by the blue flame of the gas burner. Now, it is popularly supposed that heat will not travel downward—that heat will only move upward. That is absolutely true when we consider heat as carried by volumes of gas. Take a small copper rod and holding it vertically by the lower end, introduce the upper end into the flame of a blow-torch and see how quickly you will drop the rod. The heat travelling by conduction certainly travels downward. Again, as far as radiant heat alone is concerned, consider a globe of copper, heated to incandescence, hanging in mid-air. If you hold your hand

(*Continued on Page 75*)

This is the eleventh lesson (continued) of

The Heating and Ventilating Magazine's

New Home-Study Course in Gravity Steam and Water Heating

Instruction in this course is available only to subscribers of The Heating and Ventilating Magazine. The first lesson appeared in the November, 1924, issue. However, students can commence the course at any time. Immediately upon receipt of your enrollment, Lesson 1 will be sent to you, together with the Work Problems pertaining to Lesson 1. Full directions will be included as to where to send your solutions of the Work Problems.

The complete course consists of not less than 30 lessons. The first five lessons are devoted to the fundamentals of heating and ventilation. The second section, commencing with Lesson 6, is devoted to gravity water heating. This will be followed in due course by sections on radiators and radiation, gravity steam heating, steam and water boilers and cost estimating.

The cost of the complete course, including a critical analysis of the Work Problems as solved by each student, is $80.00, payable in equal monthly installments of $10.00. An enrollment blank will be sent you upon request, together with full directions for securing all the benefits of the course.

Students who satisfactorily complete the course will be awarded a Graduation Certificate which will correspond in value to the character of the lessons themselves.

SPECIAL NOTICE—Effective September 1, the price of THE HEATING AND VENTILATING MAGAZINE'S Home Study Course in Gravity Steam and Water Heating is $100.00. This advance in the price of the course has been found necessary due to the amount of work involved in the handling of the lesson sheets and to the fact that each student is now supplied with the text and problem sheets in convenient loose-leaf form, arranged by colors for different parts and fully indexed for future reference. In this way each subscriber to the course who completes the lessons will possess a complete reference handbook which eventually will cover the entire field of heating and ventilation.

Lesson No. 11—Forced or Accelerated Water Heating Systems

(Concluded from September issue)

*By Ara Marcus Daniels**

ANOTHER type of closed water heating system, here illustrated, affords an example in which a special differential relief valve is used and an automatic damper regulator controls the fire to produce the desired room temperature. Fig. H-6-13 shows a typical layout for a down-feed closed system of this type, with tank in attic. Fig. H-6-14 shows the special apparatus applied to an up-feed tank-in-basement system.

The essential parts of this system are the damper regulator, the differential-pressure relief valve and the air-tight expansion tank.

The automatic temperature-damper control is governed by the change in temperature of the water in the system—not by pressure. The active element is a multiple-disc thermostat the movement of which, through lever action, opens and closes the dampers of the heater.

The differential-pressure relief valve is shown in section in Fig. H-6-16. The manufacturer describes its operation as follows:

"The water enters the differential-pressure relief valve at A, passes through opening B into by-pass C, to opening D into top chamber E. The valve member is closed tight when not under pressure by means of the tension of coil spring 7.

"As pressure accumulates from the system, diaphragm 9 is forced against adjustable plate 8, which pushes down upon valve stem 4. When pressure has become sufficient to counteract the tension of coil spring 7, the valve unseats and allows the water from chamber A to pass out through middle chamber at opening G. As the pressure recedes, the coil spring pulls valve disc back against its seat when overflow ceases."

TABLE H-6-5
EXPANSION TANK CAPACITIES FOR THRUSH FORCED WATER HEATING SYSTEM

SIZE NO.	DIMENSIONS INCHES	CAPACITY SQ. FT. RADIATION
0	10 × 48	350
1	12 × 48	750
2	12 × 60	1250
3	14 × 60	2000

*Copyright, 1925, Ara Marcus Daniels.

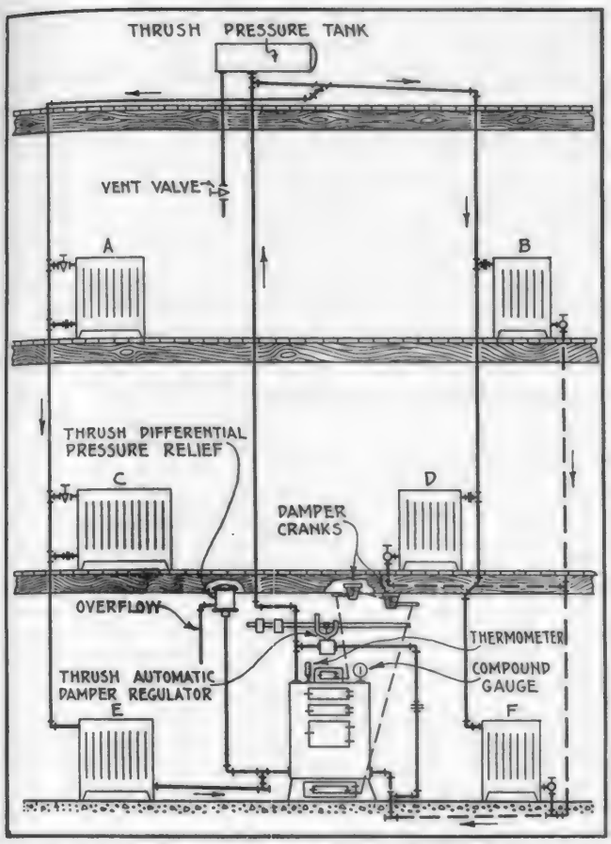
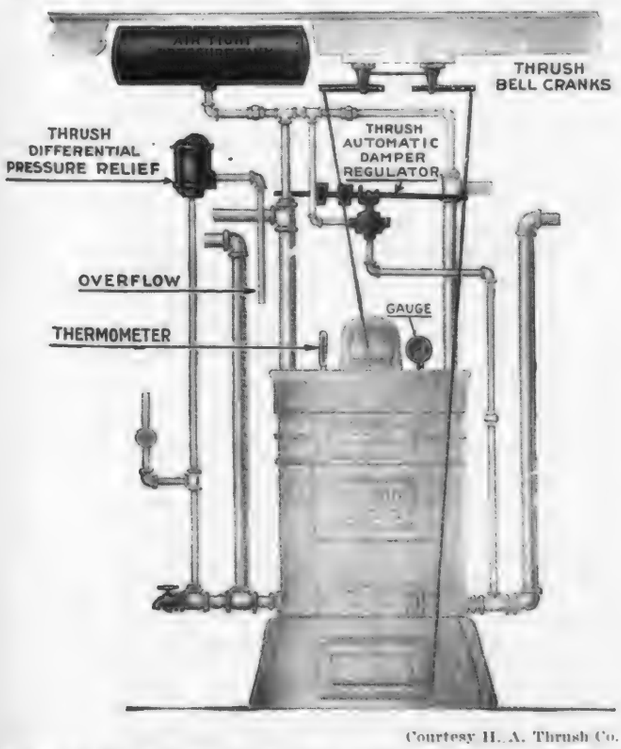


Fig. H-6-13. Typical Design for a Thrush Down-feed Forced Water Heating System with Tank in Attic

The tanks used with this system must be air tight. The manufacturer specifies four sizes with dimensions and capacities as given in Table H-6-5. The specified size should be used. If a system consists of more than 2000 sq. ft. of radiation, more than one tank should be installed and connected as shown in Fig. H-6-17.



Courtesy H. A. Thrush Co.

Fig. H-6-14. Application of the Thrush System to an Up-feed Tank-in-Basement Forced Water Heating System

Work Problem H-6-13

In Fig. H-6-18 the temperature control damper regulator system is shown installed on a sectional cast-iron boiler.

TABLE H-6-6
SIZES OF VALVES RECOMMENDED FOR A CLOSED WATER HEATING SYSTEM OF THE THRUSH DESIGN

Radiator Location	Direct Radiation Square Feet	Valve Size
First Floor	Up to 70	3/4"
	Up to 125	1"
	Over 125	1 1/4"
Second Floor	Up to 25	1/2"
	Up to 90	3/4"
	Over 90	1"
Third Floor	Up to 40	1/2"
	Up to 120	3/4"
	Over 120	1"

THE VALVE ON THE RADIATOR AT THE END OF THE MAIN SHOULD, GENERALLY, BE MADE ONE SIZE LARGER THAN THE TABLE INDICATES.

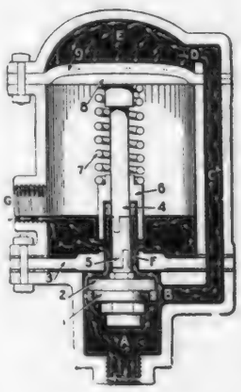
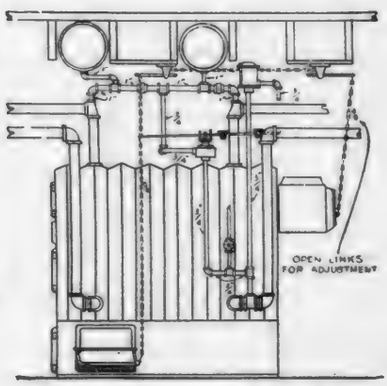


Fig. H-6-16. Differential Pressure Relief Valve Used with the Thrush System



Courtesy H. A. Thrush Co.

Fig. H-6-17. Illustrating the Use of Multiple Tanks for Systems in Excess of 2000 Sq. Ft. Direct Radiation.

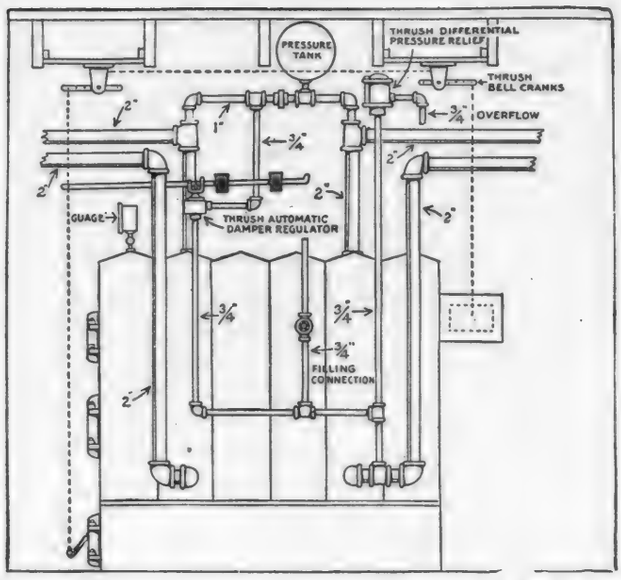
Work Problem H-6-14

When a low-ceiling basement is encountered where it is impossible to place the pressure tank to permit making the piping connections as shown in preceding figures, the manufacturer recommends the arrangement shown in Fig. H-6-19. The pressure-tank connection is taken off at the top of the two flow risers, thus trapping the air. The end of the pipe is then dropped low enough for connecting into the bottom of the pressure tank.

Work Problem H-6-15

PIPING SYSTEM DESIGN

The manufacturer of this system specifies slightly different valve sizes for radiators (see Table



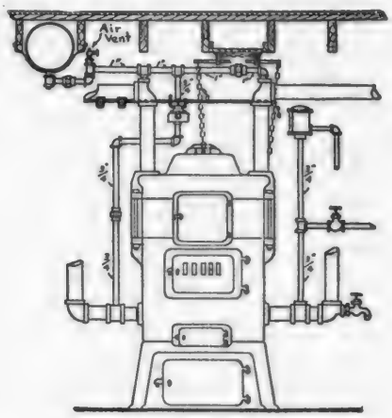
Courtesy H. A. Thrush Co.

Fig. H-6-18. Thermostatic Damper Control Applied to a Sectional Cast-iron Boiler

H-6-6) than were given in a similar table recommended by another manufacturer. While the use of either table should give equally good results, the student should follow the recommendations of the respective manufacturer whose apparatus he intends to use. In laying out and proportioning a system, all preceding instructions as to sizes for mains, branches and risers and the manner in which they are connected up should be observed.

Work Problem H-6-16

Another application of the relief valve and air-cushion principle is illustrated in Fig. H-6-20 and H-6-21. The relief valve is of the gravity-action type (see Fig. H-6-22). It is set to relieve pressure on the system at 30 lbs. per square inch. The lead ball is held in vertical alignment by means of a piston of suitable material which moves in a guide at top and at bottom. With a closed system using this valve, an air-tight pressure tank is required. The system is operated by first driving all air from the radiators and piping by filling them with water, relieving the first-floor and then higher-floor radiators in turn so that the system is under none but hydrostatic pressure. The air entrapped in the pressure tank acts as an air cushion when the water in the system expands due to heating. As long as the system is operated within temperature limits that do not require the relief valve to discharge water from the system, no make-up should be required. The altitude gage pointers are used as the index to determine when additional water should be admitted to the system.



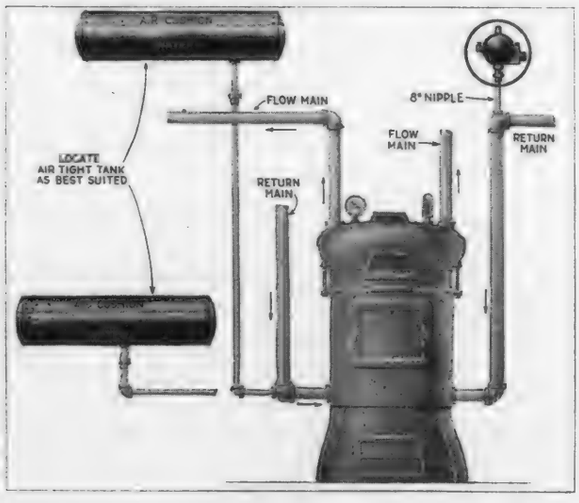
Courtesy H. A. Thrush Co.

Fig. H-6-19. Application of Thermostatic Damper Control System to a Low Ceiling Basement

CLOSED WATER HEATING SYSTEM WITHOUT TANK

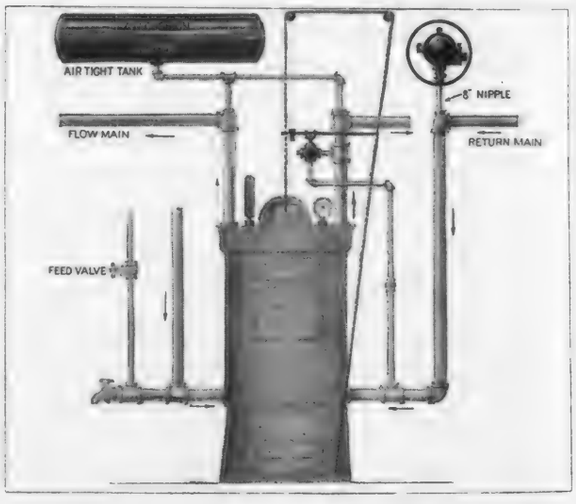
The essential parts of the closed water heating system in which the tank is omitted are a specially-designed relief valve and a water-reducing valve, combined with a damper regulator. It thereby embodies automatic damper regulation, automatic relief and automatic supply.

The relative position of the various parts of this type of system are shown in H-6-23. The reducing valve is set to close at a pressure of 10 lbs. per



Courtesy Neptune Meter Co.

Fig. H-6-20. Application of Red-Top Relief Valve to an Air-Tight Tank-in-Basement Water Heating System



Courtesy Neptune Meter Co.

Fig. H-6-21. Application of Red-Top Relief Valve with Thermostatic Control

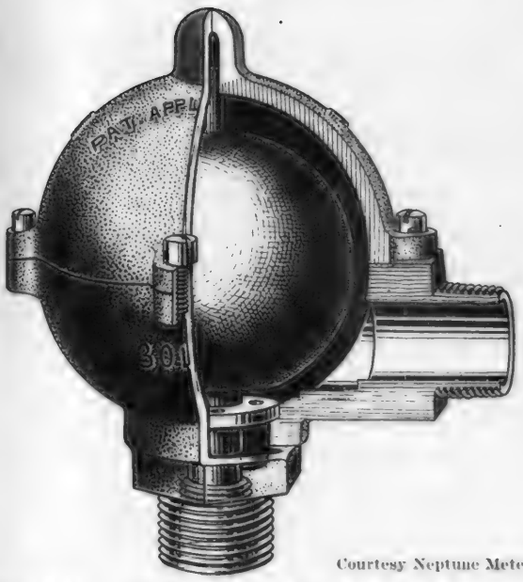


Fig. H-6-22. Gravity Action Type Ball Relief Valve for Closed Water Heating System

square inch, which is usually ample to fill the radiators. As the water in the system is heated and expands, the pressure rises proportionally until a value of 25 lbs. is reached when the relief valve operates and permits a small quantity of water to pass out through the discharge to floor drain.

The damper regulator is set to maintain a desired water temperature. If the relief valve opens before that temperature is reached, it is permitted to continue to discharge until the temperature of the water has risen to the proper point, when the damper regulator functions to check the temperature rise. The relief valve then closes. The temperature of the water drops and the pressure follows suit. This drop in pressure continues until it reaches 10 lbs. per square inch when the reducing valve opens and admits enough water to replace that passed by the relief valve. It is essential that air be released regularly from the radiators in order that it may not accumulate to a degree sufficient to interfere with proper heating of the system. It is unnecessary, however, to fill the system manually.

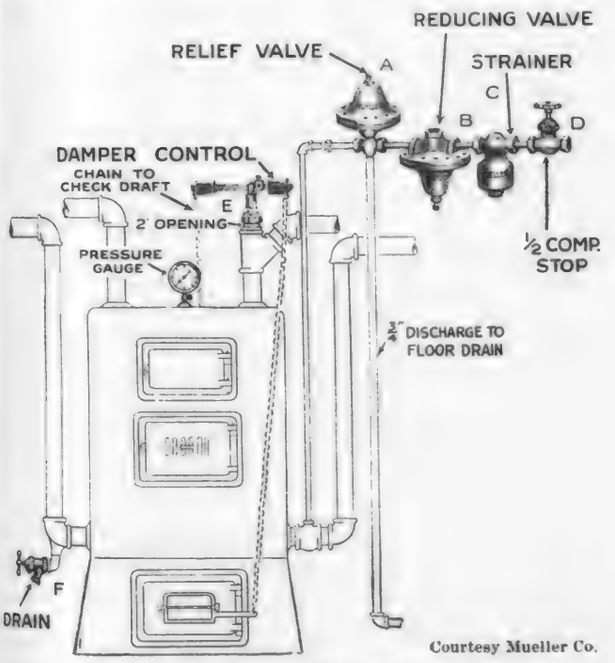


Fig. H-6-23. Closed Water Heating System Without Expansion Tank

The manufacturer of this equipment recommends that the damper regulator be installed as shown in Fig. H-6-23 unless its position at the boiler is too high to operate the weights for different desired temperatures conveniently. An alternate method is to insert a tee in the vertical section of the flow main and install the regulator in another tee placed in the same horizontal place, with a bottom connection carried to the return header. When a room thermostat is used the connections should be as shown in Fig. H-6-24.

Work Problem H-6-17

PIPING DESIGN

Either of the tables given above may be used for determining the size of radiator valves while risers, branches, and mains should be proportioned by the valve-area method as previously described.

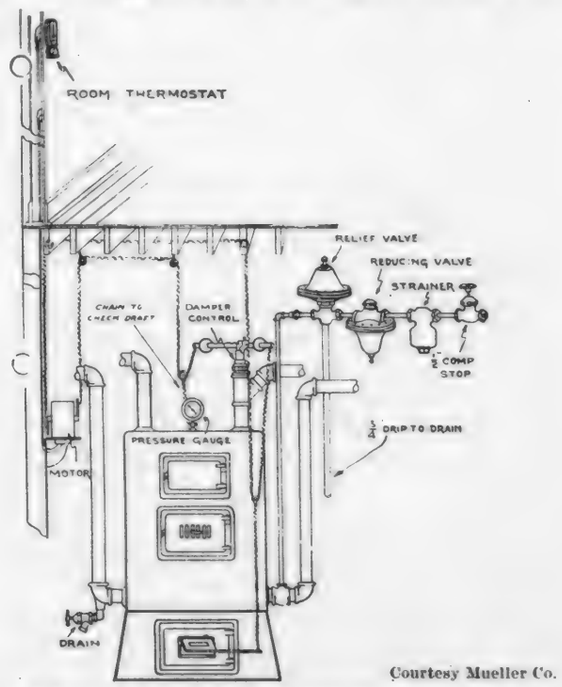


Fig. H-6-24. A Closed Water Heating System With Tank Omitted and Thermostatic Control

Work Problem H-6-18

NOTE: The author expresses his grateful appreciation for courtesies extended him in preparing this lesson of the home-study course by the manufacturers of appliances for accelerated systems.

Lesson No. 12, the last of the water heating section, to appear next month, will cover the preparation of riser diagrams, contain several examples of poor functioning water heating systems, with problems involving design and inspection reports on same, to test the students' grasp of the principles covered in preceding lessons.

Heating Buildings of Large Areas and High Roofs

With Comparative Installation and Operating Costs, Using Direct Radiation in One Case and Unit Heaters in the Other

By *William W. Gaylord*

THE usual methods of heating buildings of large areas and high roofs have been until recently to install a fan-blast system with ducts to various parts of the building or to install direct radiation along the walls or at other convenient points near the floor line, for general heating, and to use pipe coils or cast-iron radiation suspended under the roof to make up the heat losses through the roof and skylights.

The advantages of the fan-blast system are that by the proper arrangement of the duct system a smaller amount of heat will keep the building comfortable at the working level, and the temperature under the roof will be lower and, therefore, the heat losses from the building less. By its centralized control it can be regulated to the weather requirements more easily than a system of direct radiation.

The disadvantages of the system are that the ducts take up a great deal of valuable room if placed above the floor and are expensive and hard to keep clean when placed below the floor. Workmen also frequently object to this system because of the draft of warm air found near the outlets of the ducts.

The advantages of the direct system of radiation are its ease of installation without serious loss of valuable space, and the fact that radiation can usually be placed near the points of greatest heat losses to minimize their effect at the source.

The disadvantages of the system when applied to buildings with large open areas are that the air heated by the radiation will immediately rise to the roof and the temperature near the roof will be much higher than at the working level, thus causing greater heat losses from the building and less comfortable working conditions at the floor level.

TYPICAL CONDITIONS CAUSING UNEVEN HEATING

In the building of the type shown in the drawing, where the roof is approximately 50 ft. above the floor and the length of the building is placed nearly parallel with the direction of the prevailing winds, experience has shown that the temperature of the building at the end opposite to the direction from which the wind is blowing will be uncomfortably high, while that at the opposite end will be uncomfortably low.

Attempts have been made to improve this condition by having groups of radiators controlled by thermostatically-operated valves placed so that the radiators on the end opposite that from which the wind is blowing will be shut off as soon as the temperature in that part of the building reaches the desired point. These, however, have not given good satisfaction as their operation has been found erratic.

Experience has also shown that when groups of radiators are arranged for manual control this will not be used to good advantage as the occupants of the building seem to find it easier to open windows than to shut off radiation.

HOW UNIT HEATERS MEET SUCH CONDITIONS

Most recent practice in heating buildings of this type has been to use unit heaters either alone or combined with direct radiation. These have the advantages of the fan-blast system in maintaining an even temperature throughout the height of the building and can be more easily controlled to maintain the desired temperature by control of the motor driving the fans in the heaters.

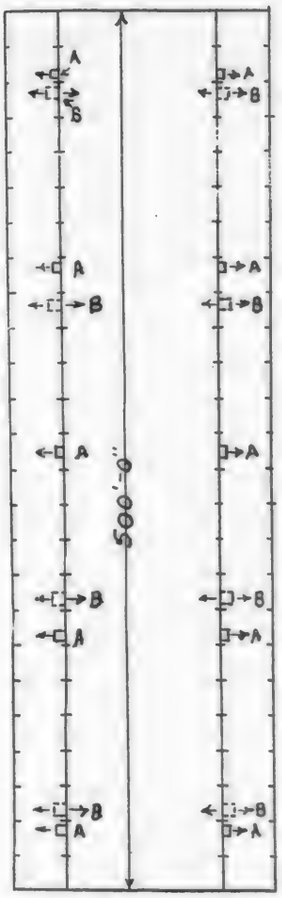
By a proper distribution of the unit heaters usually it will be possible to run a part of these in mild weather and regulate the number in operation to suit the temperature. They also give the advantage of being able to so direct the flow of heated air that places which could not conveniently be heated by direct radiation can be kept at a uniform temperature.

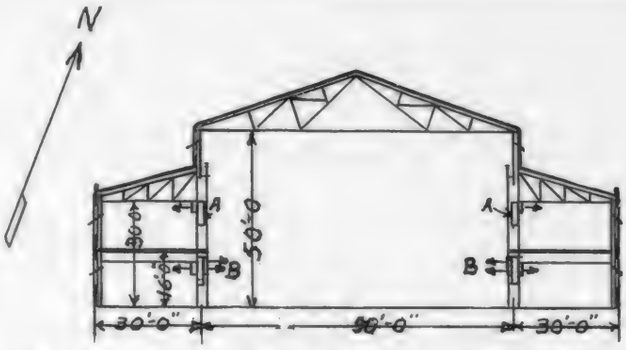
There is another great advantage in the unit heaters in that the building can be warmed up in a much shorter time in the morning because of the positive circulation over the radiating surface and the large increase in heat emission caused thereby.

COMPARATIVE COSTS OF HEATING WITH DIRECT RADIATION AND WITH UNIT HEATERS

To make an estimate of the saving possible by the use of unit heaters take the building shown in the accompanying illustration as an example.

First, assume it to be heated by direct radiation with wall-type cast-iron radiators. These are placed in six lines the length of the building as follows: One row under the windows on the first floor and





A--Heaters, 137,500 B.T.U. per hour.
B--Double heaters, 137,500 and 340,000 B.T.U. per hour.

Legend.

Building 150 ft. x 500 ft.
Side bays 30 ft. wide.
Gallery floor 16 ft. above main floor.
Height of truss:
- Side bays 30 ft.
- Center bay 50 ft.

Pilasters 4 ft. wide.
Sash:
- First floor 7 ft. 6 in. x 16 ft. wide.
- Gallery floor 10 ft. x 16 ft. wide.
- Monitor 8 ft. high continuous.
- End walls 7 ft. 6 in. and 10 ft. x 26 ft. in side bays; three each at 7 ft. 6 in., 10 ft. and 8 ft. x 26 ft. in center bay.

Roof 3-in. plank with prepared asbestos roof covering.
Walls:
- 8-in. brick on sides, with 16-in. pilasters.
- 12-in. brick at ends with 20-in. pilasters.

Heat Losses: B.T.U. per Hour per Degree Temperature Difference

8-in. brick walls	12,000	sq. ft. x	0.39 =	4680
12-in. brick walls	6,916	sq. ft. x	0.31 =	2150
16-in. brick walls	6,400	sq. ft. x	0.26 =	1670
20-in. brick walls	1,856	sq. ft. x	0.23 =	427
Glass, monitor	8,000	sq. ft. x	1.1 =	8800
Glass, gallery	8,000	sq. ft. x	1.1 =	8800
Glass, first floor	6,000	sq. ft. x	1.1 =	6600
Glass, end walls, side bays	1,820	sq. ft. x	1.1 =	2002
Glass, end walls, center bay	3,978	sq. ft. x	1.1 =	4376
Roof, side bays	32,500	sq. ft. x	0.24 =	7800
Roof, center bay	50,000	sq. ft. x	0.24 =	12000
Infiltration, 252 ventilators	548,250	cu. ft. x	0.02 =	10965
Total				70270

Details of Building Used in Example of Comparative Costs of Heating With Direct Radiation and With Unit Heaters

gallery floor, on each side of the building, and one row along the girder supporting the gallery on each side. Besides these lines running the length of the building there are six rows across the center bay and three rows across the gallery bays at the north end of the building and four rows in center bay and two in gallery bays at the south end.

Experience in similar buildings has shown that the floor of the center bay will be hard to heat, while the temperature under the roof will be so high that the heat losses are much increased. The temperature under the roof in the center bay, shown in the illustration, will probably be 25° higher than at the working plane 5 ft. above the floor line.

Based on this condition, if a temperature of 65° F. is maintained at the working plane for 24 hours per day for 200 days' heating season and the average outside temperature is 40° F., the total heat losses from the building per season will be 12.5 billion B.T.U.

The cost of coal to supply this heat based on a price of $6.00 per ton, a heat value of 13,000 B.T.U., and a boiler efficiency of 65% is

$$\frac{6.00 \times 12{,}500{,}000{,}000}{13{,}000 \times 2{,}000 \times 0.65} = \frac{12{,}500 \times 6.00}{16.9} = \$4{,}430.00$$

The direct radiation will be 17,500 sq. ft. and the cost of installation about $39,375.00.

Assuming fixed charges of 15% per annum, the operating cost per year exclusive of labor will be

Coal	$4,430.00
Fixed charges	5,906.25
Total	$10,336.25

With unit heaters, due to the positive circulation, the temperature under the roof will probably be not more than 10° higher than at the working plane.

Based on this condition, if a temperature of 65° is maintained at the working plane for 24 hours per day for 200-day heating season and the average outside temperature is 40°, the total heat loss from the building per season will be 10,669,000 B.T.U.

The cost of coal to supply this heat based on a price of $6.00 per ton, a heat value of 13,000 B.T.U. and a boiler efficiency of 65% is

$$\frac{10{,}669{,}000{,}000 \times 6.00}{13{,}000 \times 2{,}000 \times 0.65} = \frac{10{,}669 \times 6.00}{16.9} = \$3{,}787.81$$

The cost of installing a heating system with unit heaters complete, including boilers, heaters, piping, vacuum pump, etc., will be about $27,000 and the fixed charges on this, at 15%, will be about $4,050.00. There will be 8.5 H.P. in motors driving the fans in the heaters and if it is assumed that these will be running one half the time they will use 15,300 K.W.-hours per season, which, at 2.5c per K.W.-hour, will cost $382.50.

Then the operating costs per season will be (labor excluded as being the same for both systems):

Coal	$3,787.81
Fixed charge	4,050.00
Electricity	382.50
	$8,220.31

The annual saving will then be as follows:

Direct Radiation	$10,336.25
Unit Heaters	8,222.31
	$2,113.94

This comparison shows that the installation cost of unit heaters will show a saving of about 30% while there will be a saving in the annual operating cost of about 20% over direct radiation.

There are several methods possible of placing the unit heaters and the cost of the system will depend to a considerable extent on the arrangement and size of the units chosen. The arrangement shown in the drawing gives a good distribution with a minimum number of heaters and simple arrangement of piping.

Each installation should be studied carefully and the size and type of heaters chosen which will give the best results at a reasonable cost.

TABLE 1.

DIRECT RADIATION—HEAT LOSSES PER SEASON

Heat losses per season (200 days) based on direct radiation and 65° F. inside temperature at working line and average outside temperature of 40° F.

Roof center bay	12,000 × (90—40)	= 600,000
Monitor glass	10,200 × (85—40)	= 459,000
Roof, side bays	7,800 × (82—40)	= 327,600
Gallery glass, Brick walls, First-floor glass	28,305 × (70—40)	= 849,150
Infiltration	10,965 × (72.5—40)	= 357,000
B.T.U. per hour		2,592,750

for 4800 hours = 12,500,000,000 B.T.U. per year.

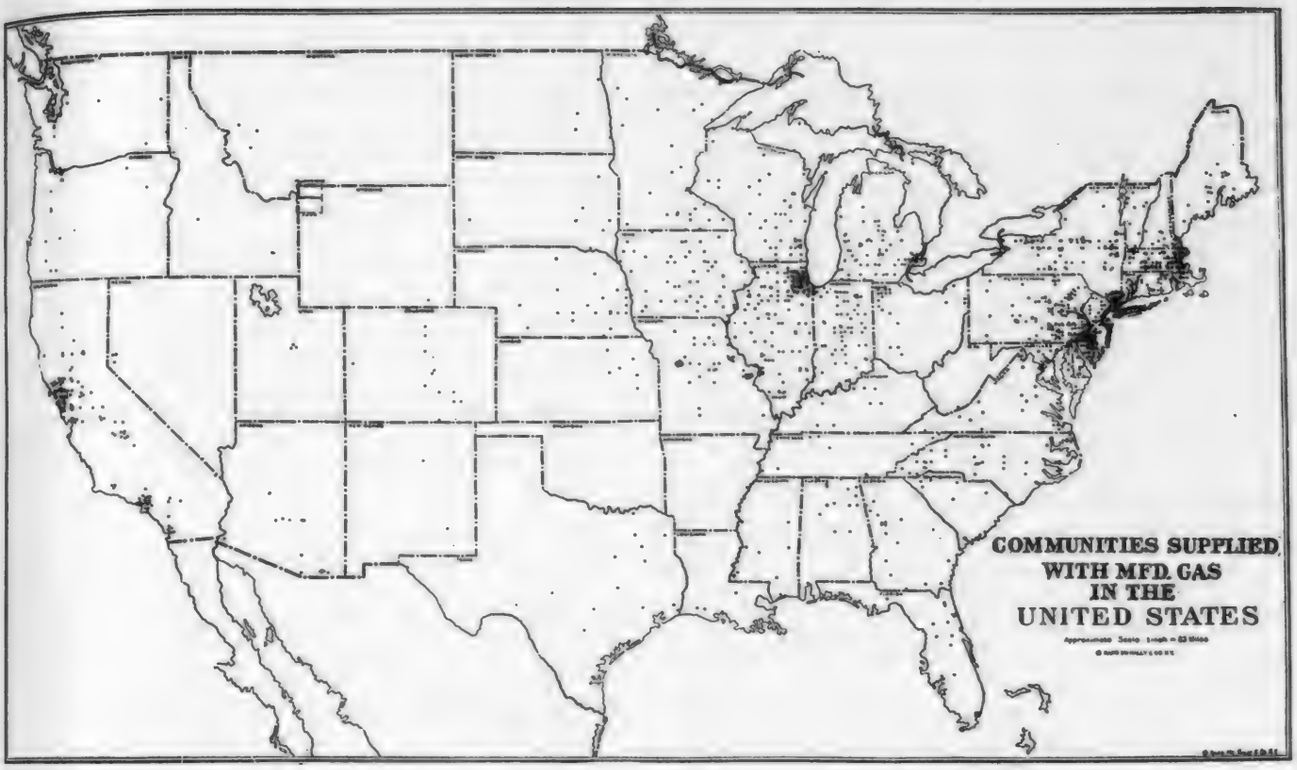
TABLE 2.

UNIT HEATERS—HEAT LOSSES PER SEASON

Heat losses per season (200 days) based on unit heaters and 65° F. inside temperature at working plane, 75° inside temperature under roof (10° rise) and outside temperature of 40° will be

Roof center bay	12,000 × (75—40)	= 420,000
Monitor glass	10,200 × (75—40)	= 375,000
Roof, side bays	7,800 × (72—40)	= 249,600
Gallery glass, Brick walls, First-floor glass	28,305 × (70—40)	= 849,150
Infiltration	10,965 × (70—40)	= 328,950
B.T.U. per hour		2,222,700

for 4800 hours = 10,669,000,000 B.T.U. per year.



Gas Industry on Qui Vive for House Heating Load

The Development Work Accomplished, Manufactured Gas Companies are Taking the Aggressive

By C. George Segeler
Industrial Editor, American Gas Association.

IT IS not a new thing, this gas-fired central house heating, but it is taking on a new significance with an astonishing swiftness for, than it, there is probably no more absorbing topic confronting the gas companies today. Originally gas was used for home heating only in those sections where a plentiful supply of natural gas was available at rates so low that coal was hardly a competitor. Slowly it was extended to a wealthy few who were willing to disregard cost and utilize manufactured gas for the sake of the convenience it offered. The gas companies made little or no attempt to cultivate the business but in spite of this lack of interest the number of installations steadily increased.

If anyone had been interested enough to undertake a survey in 1915 they would probably have been able to count the number of manufactured gas house-heating installations, even in the largest cities, on their fingers. Five years later, a number of companies had begun to actively cultivate the field but public interest was still lacking. Since then a number of factors have arisen which have altered the attitude of the average home owner. Coal shortages and strikes, poorer grades of fuel, difficulties in securing adequate service from furnace men have all been exerting a definite pressure urging the adoption of newer automatic fuels.

OIL BURNING A STEPPING STONE TO GAS

Oil was the most obvious of these, but when burners first were introduced they were frequently in the experimental stage and offered by individuals who lacked the financial backing to make the venture a success. Then again, many of the early burners were designed for natural draft which made their proper operation exceedingly problematical. Finally because the actual installation was often done by plumbers or salesmen unfamiliar with the basic principles of combustion, the amounts of fuel consumed became excessive.

It is not necessary to review the many early difficulties attendant on the introduction of oil burners. Such things occur in every new industry.

The gas burners were not new however. Utilization methods were thoroughly understood and trained engineering organizations were ready to

back them up with expert service if necessary. It is not surprising then that in the last two years the public has turned to gas for their automatic fuel. It does possess every advantage. It is clean, odorless, noiseless and burns with uniform heat production and without smoke. As a matter of fact all other fuels are gasified before they can be used, anyway. It is both good engineering and in the interest of fuel conservation to gasify the fuels efficiently at a central plant rather than in the inefficient wasteful manner in the average furnace. That the public has realized this can be seen in the rapidly accelerating growth of the business, particularly in the West. One manufacturer of pipeless furnaces reports that there are over 100,000 installations of his type furnace, burning gas. Portland, Oregon, reports that there are more than sixty-six hundred central house heating systems in medium and large sized homes in that city. New York and the metropolitan area has several thousand steam and hot water installations fired by gas. Chicago, Baltimore, Boston and all of the other large cities have shown proportionate increases.

GAS HEATING POSSIBLE IN MANY COMMUNITIES

While these remarks have been largely about the activity in the large community, a glance at the map will show how widespread the availability of gas is. There are no communities listed in the U. S. Census report of 1920 whose population reached 10,000 that are not supplied with some kind of gas service. The map shows the distribution only of communities supplied with manufactured gas in the United States. Each of these is a prospective user of large quantities of gas for home heating, for the better class of homes at first and as the service spreads for a rapidly widening group. Communities having only a natural gas supply have not been shown on the map, so that large populous areas in western New York, Pennsylvania, Ohio and West Virginia may appear lacking in gas service. This is, of course, the largest of the natural gas areas in the country, more than 1100 communities having natural gas.

To answer the question foremost in the mind not only of the heating and ventilating engineer, but also of the consumer—how much will gas cost—it is necessary to emphasize that while gas is going to be more expensive, it is not a substitute for coal. When a man buys a Cadillac or a Packard he provides himself with more than a mere method of locomotion. He could get that from a Ford. He buys in addition comfort, convenience and service which can not be estimated on the basis of so many cents per mile. So it is with gas service. There is an old adage that "you get what you pay for." It is not true when you use gas. You get more.

THERMOSTATIC CONTROL OF GAS DIFFERENT

A prime difference, to begin with, between coal and gas is that practically no installations are made without thermostatic (for water heating both thermostatic and water temperature control) control. This means that the indoor temperature of the house will stay in the range set—say 68°-70°, *without variation.* This is different than with coal even when the latter is similarly controlled, because the condition of the fire may not warrant the particular operation of the dampers. The room temperature may be low and call for heat at a time when the coal fire is too low to warrant wide open dampers. Likewise the fire may be fresh so that by the time the desired room temperature is reached, it has acquired sufficient headway to deliver a considerable excess of heat, before it is checked. Therein the gas heated home possesses a great advantage. Recording temperature charts from many installations in New York show maximum variations of only 4° even during the severest weather.

A second difference between coal and gas is in the relative efficiency with which these two types of heating plant operate. It is this difference that so largely breaches the gap between coal and gas cost. Consider first the coal furnace. It is hardly necessary to point out the wide discrepancy between laboratory efficiency tests and practical operation, yet some very recent results reveal startling conditions. A large grey iron foundry in the East which is managed by very capable engineers decided to enter the boiler field but before so doing ran laboratory tests on all of the makes of boilers used in their territory. Firing was done by experts on an hourly basis and every possible thing done to make the operating efficiency as high as possible. The results were very gratifying. The boilers showed 70-75% efficiency but the next test was firing them as in the average home, three times a day with an ordinary furnace man doing the firing while the engineer ran the efficiency test. The average was below 35%. This result is also confirmed by other similar investigations and show the danger of using laboratory tests as a guide.

GAS BOILER EFFICIENCY PRACTICALLY CONSTANT

The gas boiler on the other hand shows the same results whether in laboratory test or in the home; as a matter of fact, better in the home, because the stack and radiation losses are not entirely lost. In either case operation is under completely automatic control and 80% at least of the total number of heat units available from the gas are usefully turned into building heat. Even now gas engineers are developing methods so that the efficiencies will be raised to almost 90%. The path is clear. Gas-fired house heating has come to stay and is already making big inroads into the older, cruder methods of securing building heat.

The question of actual cost comparison has been purposely avoided because it depends entirely on the local rate for gas and its heating value. As a generalization, an estimate can be based on a figure of 0.20 cu. ft. of gas of 530 B.T.U. heating value. per degree day for each square foot of *net installed* steam radiation. The degree days for any locality can be found from the Iso-Degree Day Chart, pub-

lished in the September issue of HEATING AND VENTILATING. Simply multiplying 0.20 by the number of degree-days and again by the square feet of radiation will give the cubic feet of gas required for the season, provided the installation is calculated on the basis of 0° minimum outside temperature and 70° inside. For other outside minimum temperatures multiply by

7/8 for — 10°
7/6 for + 10°
7/5 for + 20°

For other than steam heating systems the basic figures are as follows:

Hot water system—0.10 cu. ft. of gas per degree day for each square foot of hot water radiation.

Warm air system—0.50 cu. ft. of gas per degree day for each 1000 B.T.U. hourly loss from the building.

COAL BOILER CONVERSION TO GAS NOT PRACTICAL

A most obvious suggestion is to convert existing coal boilers to gas. Most gas engineers are agreed that this can not be made a commercial success because conversions require individual service and attention that usually wipes out any possible profit. It is usually true that if the customer can not afford the expense of a gas designed system, he never will be able to pay for the high operating cost of converted equipment. Not only do the gas companies insist on new equipment but generally they decline to install it, unless the heating system can be put into perfectly first class shape so that satisfactory heating is assured.

At best the inherent features of coal boiler design argue against efficient conversions. The relation of direct to indirect heating surface in a coal boiler is calculated to permit a large portion of the heat absorption to take place by direct radiation rather than conduction and convection. The non-luminous gas flame has very little radiating power and as a result heat absorption should largely be from the baffled indirect surfaces, the flue products not having opportunity to come in contact with the direct surface. As a result, two conditions are found on conversion; first, if the efficiency is kept high by burning a small amount of gas, the rated boiler capacity can not be obtained; second, if the amount of gas is increased until the boiler delivers its rated capacity, the flue loss increases so that the efficiency falls way off. Incidentally, these same objections are applicable to converted oil boilers and constitute a strong argument against oil burner conversions by other than very experienced engineers.

CROSS CONNECTION OF GAS AND COAL BOILERS FEASIBLE

Cross connection of the old coal boiler and the new gas boiler however is a recommended practice when the space is available. This enables the owner, if he feels it necessary, to reduce his cost very considerably by using coal to heat during the

(*Continued on Page* 75)

Pumps for Hot Water Supply

SPEAKING before the Institution of Heating and Ventilating Engineers on the subject of hot-water supply installations for large infectious disease and mental hospitals, Herbert G. Cathcart had some interesting things to say regarding the selection of pumps for circulating hot water. In the great majority of centralized plants, he said, installed in the institutions of the Metropolitan Asylums Board, direct-acting, vertical, general service pumps of the vertical type have been installed, but there are several plants where motor-driven centrifugal pumps are working with equal success. Where the levels of the institution make it possible, these pumps are connected and valved with by-passes, so that during the night the plant can be run as a gravity system, or in the event of a pump break-down, the services are not completely closed or cut off.

In the case of pumps, Mr. Cathcart also strongly recommends that a spare or stand-by machine is installed, connected as in the case of the spare calorifier, so that it can deal with either the heating or hot-water supply services.

The speed of direct-acting pumps in connection with forced circulation systems is of considerable importance, especially in hospital work. The pumps should be of such size that they are capable of dealing with a full load without being forced to work at too high a speed. It is generally found that sixteen double strokes per minute is the ideal to aim at, and that twenty to twenty-two double strokes per minute should never be exceeded. At any greater speed than this the pulsation of the pumps becomes audible, and at night times when all else is quiet causes considerable irritation to the patients.

The correct position of the circulating pumps is at the end of the return mains and at a point close to the calorifiers, the cold water make-up being connected to the return main between the pumps and the calorifiers. By such an arrangement the pumps under ordinary working conditions prevent the cold water backing up the return main, in the event of a draw-off occurring which is greater in volume than the water delivered by the pump; such an arrangement gives excellent results, where the static head is high, and considerably in excess of the frictional-head resistance against which the pump works. Where no water tower exists and the static head available is only that provided by cold water storage tanks in roof spaces, considerable caution should be exercised in connecting the cold especially if the frictional-head resistance of the circuit nearly approaches to static head. Here it is necessary to tolerate one evil in order to overcome a greater, and the cold water make-up should be connected to the suction side of the pump and not the delivery side.

In cases of low static head considerable trouble is courted by restricting the size of the cold water make-up main, and it should never be less in diameter than that of the flow pipe at its origin.

Heat Requirements of Intermittently-Heated Buildings

A New Graphic Method of Computation, for Walls of any Construction and for all Outside and Inside Temperatures

By William Sommer

MANY investigations have been made during the last few years to clear up the question of heat transmission through building construction. The heat losses can now be computed with practically sufficient accuracy, owing to the ample research work conducted on the subject.

But there is one question we know very little about. We generally assume steady conditions in figuring heat losses from building construction. This can be considered correct for all cases where the radiators are kept warm nearly all the time in cold weather, but different conditions are encountered with buildings intermittently heated.

The following discussion deals with a practical method of computing the heat requirements for intermittently-heated buildings.* The method is merely graphical. Its results, as summarized in charts, will enable the heating engineer easily to solve such problems.

THE PROBLEM AND HOW TO SOLVE IT

The increase in temperature of a room which is being warmed up depends largely on the heat transmission and on the specific heat of its walls. Fig. 1, for instance, shows the increase in room temperature with two different enclosures. Both have the same heat transmission coefficient K, and are exposed to the same outside temperature of 32° F.; but curve "a" is that for a thin wall with a low heat conductivity, whereas curve "b" is for a thick wall with high heat conductivity.

With a radiator capacity just sufficient to keep the room at 68° F. the room temperature "a" rose to 65° F. after two hours whereas "b" reached only 56° F. In order to heat up either room to 68° F. within two hours, we have to increase the capacity of the radiator in room "a" by $\frac{68-32}{65-32} = \frac{36}{33}$ or about 10% and the one in room "b" by $\frac{68-32}{56-32} = \frac{36}{24}$ or about 50%.

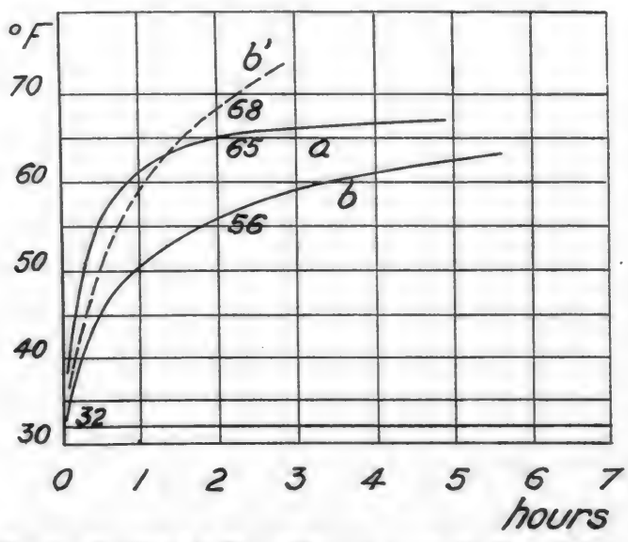


Fig. 1. Increase in Room Temperature with Two Different Enclosures

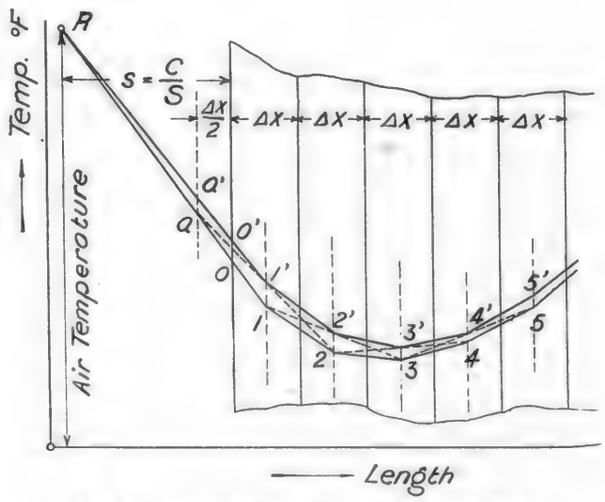


Fig. 2. How Heat Penetrates a Cold Wall

If the capacity of the radiators was so increased the room temperature would rise according to "b' " and would reach 68° F. within 2 hours.

Our problem can be solved, therefore, by determining the temperature increase as effected by a radiator sufficient to maintain 68° F. in the room, and by adding a certain percentage afterwards, as just explained.

First of all, however, we have to analyze how heat penetrates a cold wall, or, in other words, we have to determine the temperature of the wall as a function of the time. This may be done by the following graphical method.

* From a paper by Dr. Ing. Ernst Schmidt, of Munich, Germany, presented before the annual meeting of the German Heating Industry and reported in *Gesundheits-Ingenieur*, Vol. 47, No. 50, December 15, 1924.

HOW HEAT PENETRATES A COLD WALL

In order to get an idea of the principle of construction we first assume any temperature throughout a homogeneous wall, as shown in Fig. 2, and see how this temperature changes with the time.

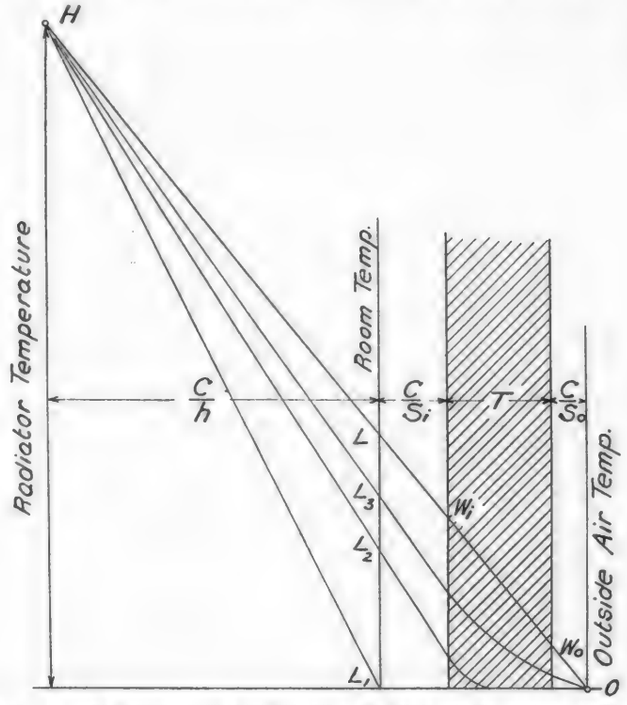


Fig. 3. Application of Graphical Method to Warming Up of Cold Room

The polygon 0, 1, 2, 3, . . . represents the temperature at the time t. The wall has been divided into equal parts $\triangle x$, and we will assume the points 0, 1, 2, . . . are the average temperatures of these parts, respectively. Remember that the heat flow at any point of a homogeneous body is in proportion to the inclination of the temperature curve, or expressed by a formula:

$$Q = C \frac{dt}{dx}$$

The steeper the curve the more heat flows through per hour. Consequently there must be a change of temperature in every polygon corner. The greater the different of inclination of two adjoining sides of the polygon, the more rapidly will the temperature of that point vary.

Connect point 1 with 3. Then the length 2-2′ represents the change in temperature for the time $\triangle t$, and 2′ is the new temperature at the end of the period $\triangle t$. Likewise connect 2 with 4, and 3-3′ is the change in temperature of another point after the period $\triangle t$.

The construction at the surface is somewhat different. Point R is maintained for all the successive curves. Its ordinate is equal to the room temperature and its distance from the wall surface is equal to $s = \frac{C}{S}$, wherein

C = coefficient of heat conductivity of the wall.
S = coefficient of heat transmission between wall and air.

Point 1′ is to be found by connecting 2 with a, which is the intersection of (R-1) with an auxiliary line at a distance $\frac{\triangle x}{2}$ from the wall.

Thus we find all the points 1′, 1′, 2′, . . . of the new temperature curve after the period $\triangle t$. A third curve representing the temperature after $2\triangle t$ can be derived from the second one in the same way, and so on. The period between two successive curves is:

$$\triangle t = \frac{(\triangle x)^2}{2a}, \text{ wherein}$$

$$a = \frac{C}{c\,w}$$

c = specific heat of the wall.
w = specific gravity of the wall.

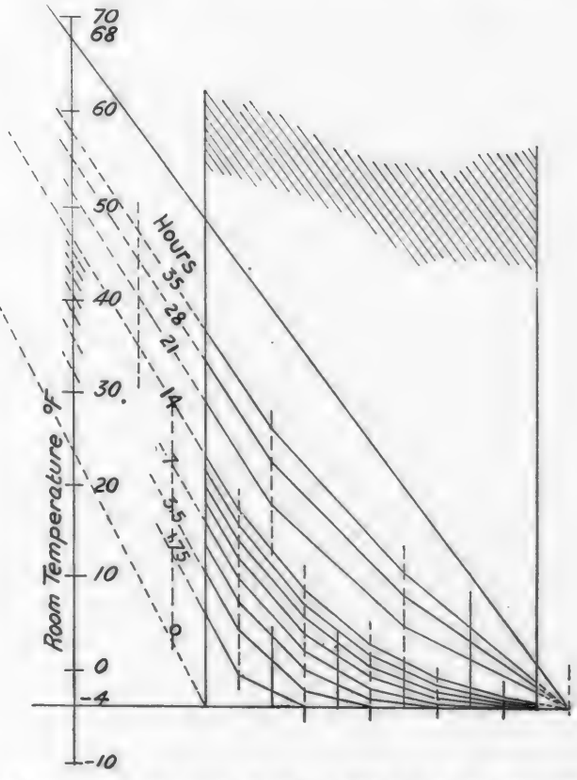


Fig. 4. Construction for a Room of 3530 Cu. Ft. Surrounded on Either Side by a 16-In. Brick Wall.

APPLICATION OF THE GRAPHICAL METHOD TO THE WARMING-UP OF A COLD ROOM

For simplyfying matters we first assume that the ceiling and the floor are of the same construction and exposed to the same outside temperature as the four walls. The temperature curve through the wall will be a straight line, as represented by W_o and W_i in Fig. 3, when steady conditions are finally reached and maintained by an adequate radiator.

We prolong this line to both sides. At the right it cuts the outside temperature at O which is also the initial temperature of the wall. At the left it cuts the ordinate corresponding to the final room

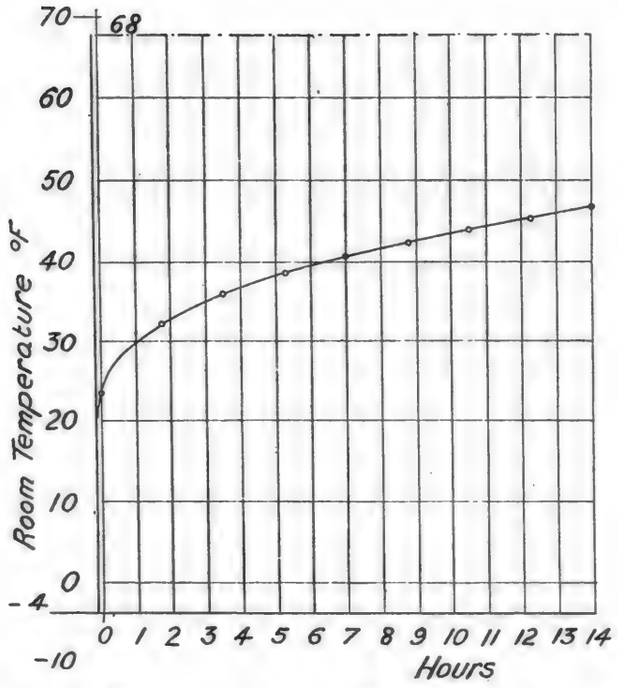


Fig. 5. Warming Up Curve for Wall Shown in Example

temperature at L, and further outside it cuts the ordinate of the radiator temperature at H.

The abscissæ are: $\frac{C}{S_o}$, T, $\frac{C}{S_1}$ and $\frac{C}{h}$ (see Fig. 2).

They are in proportion to the resistance of heat transmission which are (in Fig. 4):

$$\frac{1}{S_o} = e_o, \frac{T}{C}, \frac{1}{S_1} = e_1 \text{ and } \frac{1}{h}.$$

The starting conditions are represented by the straight line L′-H. The succeeding temperature curves, of which two are shown in Fig. 3, are constructed by the graphical method, as outlined above. They cross the L-ordinate at L_2, L_3, . . . which are the room temperatures at that time.

Fig. 4 shows the construction for a room of 3530 cu. ft. surrounded on either side by a 16-in. brick wall:

Thickness	T = 16 in. = 1.31 ft.
Specific heat	c = 0.25
Specific gravity	w = 109.2 lbs. per cubic foot.
Heat conductivity	C = 0.538 B.T.U. per square foot per hour per degree F.
Inside heat transmission	S_1 = 1.025 B.T.U. per square foot per hour per degree F.
Outside heat transmission	S_o = 4.1 B.T.U. per square foot per hour per degree F.
Room temperature at start	= outside temperature = — 4° F.
Final room temperature	= 68° F.
Radiator temperature	= 167° F.

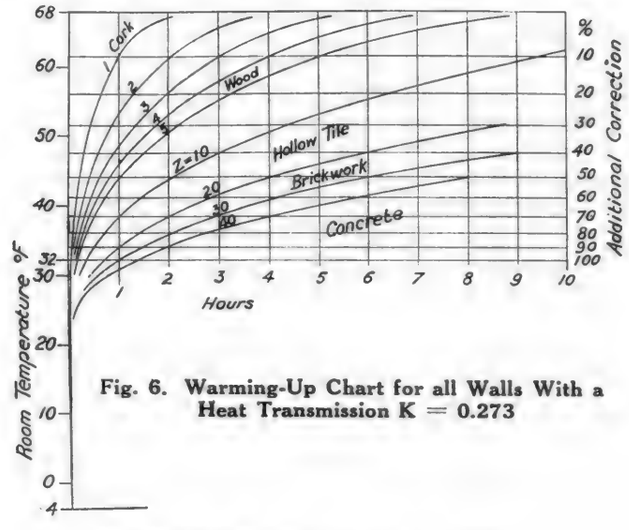


Fig. 6. Warming-Up Chart for all Walls With a Heat Transmission K = 0.273

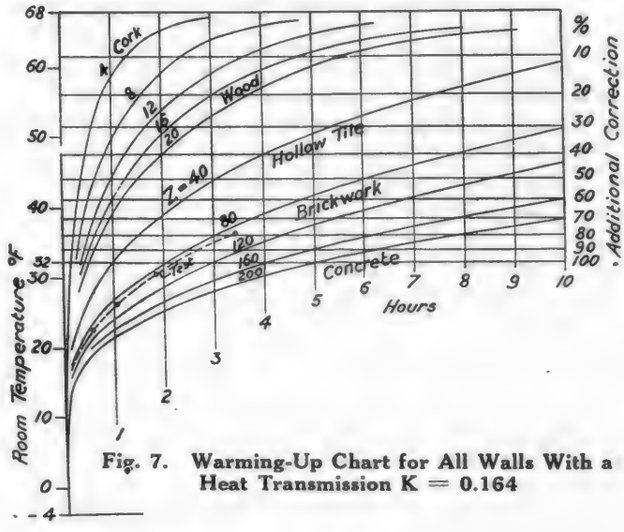


Fig. 7. Warming-Up Chart for All Walls With a Heat Transmission K = 0.164

TABLE TO FIG. 6 (K = 0.273)

	Heat Conductivity C	Thickness In. T	Specific Heat c	Specific Gravity w	Time Factor Z
Concrete	0.74	1.81	0.25	137	75
Brickwork, moist	0.54	1.31	0.25	109	43
Brickwork, dry	0.405	0.99	0.20	100	24
Hollow brickwork	0.405	0.99	0.15	75	13.5
Wood	0.094	0.23	0.45	37.5	4.7
Kieselgur	0.067	0.10	0.20	31.2	1.25
Cork	0.034	0.08	0.45	18.7	0.84

TABLE TO FIG. 7 (K = 0.164)

	Heat Conductivity C	Thickness In. T	Specific Heat c	Specific Gravity w	Time Factor Z
Concrete	0.74	3.62	0.25	137	300
Brickwork, moist	0.54	2.62	0.25	109	175
Brickwork, dry	0.405	1.98	0.20	100	96
Hollow brickwork	0.405	1.98	0.15	75	54
Wood	0.094	0.46	0.45	37.5	18.8
Kieselgur	0.067	0.20	0.20	31.2	5.0
Cork	0.034	0.16	0.45	18.7	3.3

The abscissæ are:

$\frac{C}{S_0} = \frac{0.538}{4.1} = 0.13$ ft.; $T = 1.31$ ft.; $\frac{C}{S_1} = \frac{0.538}{1.025} =$ 0.528; $\frac{C}{h}$ (by construction).

$$a = \frac{C}{c\,w} = \frac{0.538}{0.25 \times 108.5} = 0.00198$$

First T was divided into five equal parts and, after the eighth curve, the ingredients were reduced to 2½.

$$\triangle x = \frac{T}{5} = \frac{1.31}{5} = 0.262 \text{ ft.}$$

$$\triangle t = \frac{(\triangle x)^2}{2a} = \frac{0.262^2}{0.00396} = 1.75 \text{ hours}$$

$$\triangle x' = \frac{T}{2.5} = \frac{1.31}{2.5} = 0.525 \text{ ft.}$$

$$\triangle t = \frac{(\triangle x')^2}{2a} = \frac{0.525^2}{0.00396} = 7 \text{ hours}$$

The room temperature as obtained on the L-ordinate was plotted against time in Fig. 5. It is a curve similar to the ones shown by Fig. 1.

GENERALIZING FOR WALLS OF ANY CONSTRUCTION AND FOR ALL OUTSIDE AND INSIDE TEMPERATURES

It looks as if we had to construct the warming-up curve (Fig. 5) anew for every kind of wall and for all different temperatures, that is, for every new problem. But, on the contrary, we find our construction has to be done only once for every K. The curves of all the walls, with the same heat transmission K, are similar to the first one and can be deduced from it by using the relation:

$Z = \frac{T^2}{2a}$ wherein T and a are the same symbols as used before. Z is called the time factor.

Fig. 6 shows the chart for all the walls with a heat transmission K = 0.273, and Fig. 7 shows the one for all the walls with a heat transmission of K = 0.164. The curves corresponding to Z = 10 and Z = 20, respectively, were constructed by the graphical method and all the others were plotted after these, using the time factor Z. The time factors for the different walls are given on the charts.

Let us analyze the meaning of this chart. The curves plotted indicate the time it takes to warm up a perfectly cool room from — 4° F. to a certain temperature, by a radiator which would be sufficient to maintain the room at 68° F. The capacity of this radiator has to be enlarged to meet the warming-up requirements. The corresponding additional correction is given at the right of the chart and was figured as shown in the discussion of Fig. 1.

Example: A room surrounded with brick walls with K = 0.273 will reach only about 39° F. after three hours' warming-up with a normal radiator. The capacity of the latter has to be enlarged 70% in order to raise the air temperature of the room to 68° F. within the desired period of three hours.

This additional correction seems to be rather high. But it must be remembered that we started with a cold room of — 4° F. Generally, it will be quite sufficient to start from 32° F. and, in that case, the additional corrections are to be divided by two.

To simplify matters, we first assumed that the room was surrounded by six equal walls and equal outside temperatures. But ceiling, floor and walls are of different construction and of different heat transmission. For closer than rough calculations they have to be treated separately. This can be done by figuring the heat loss from each part of the six enclosures separately, using the proper warming-up factor for each surface, according to its construction and its outside temperature and then adding all together, which results in the total radiator capacity required to warm up the room within the desired period.

Gas Industry on Qui Vive for House-Heating Load.

(*Continued from Page* 71)

very severe weather, when gas consumption runs to very high figures. Of course, by so doing he is back on a service of drudgery and inconvenience even though he may save a little money.

National advertising by the leading boiler manufacturers coupled with the statements of thousands of satisfied users of gas-fired equipment and the interest of almost every gas company in the country all go to make "this house heating business" one of the most important developments of recent years. And every indication points to a successful continuation of the work. It is a real contribution to list of automatic labor saving conveniences for the American Home.

Oil-Burning Boilers Their Design and Characteristics.

(*Continued from Page* 61)

1 ft. below this or above this or on any side of it whatsoever the amount of *radiant heat* impinging on your hand is in all cases the same. Radiant heat obeys the same law as light and travels from its source in all directions, without favor, so in dealing with an oil flame with its characteristic luminous flame, filling the combustion chamber, it would appear that we have a radically different proposition from that involved in the burning of coal.

This is the first of a series of articles dealing with an important phase of the heating industry, the design and production of heating plants that will secure for the American home owner the greatest possible efficiency in the utilization of liquid fuels. Other articles in the series will appear during the Fall and Winter.

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AS ANNOUNCED last month, the latest and, in many ways, the most significant recent event in the heating field is the development of a combination gas and oil burner, designed to solve the peak heating problem of the gas man. In one sentence of an editorial last month on the subject, we were made to say that this new burner was designed to burn oil most of the time and to switch on to gas in extreme weather. This, of course, is just the opposite of the way the burner is operated, as was obvious from the context. The whole purpose of the new design is to permit the gas companies to flatten their peak loads of gas consumption. By going from gas to oil as the cold becomes intense, these dreaded peaks will not only disappear but will produce valleys which the gas companies stand ready to fill through increased industrial sales at these particular times. This is a consummation devoutly to be wished by the gas men and is the cause of their rejoicing over the opportunity it apparently affords them of assuming a commanding position in the heating industry.

Not the least of the advantages claimed for this ingenious arrangement of a gas-oil burner is the fact that a comparatively small supply of oil will be sufficient to take care of a given installation, thus obviating the need of a large, outside oil tank, with its attendant cost and expense of installation.

It is of interest to add that the Doherty interests, under whose auspices this new burner has been developed, are about to launch a publicity campaign on a national scale which is intended not only to promote the sale of their gas-oil burner, but to give the gas industry its place in the sun in the heating field.

ONE OF the interesting results of the advent of the oil and gas industries to the heating field is the fresh enthusiasm and new viewpoint they have brought to the industry. Take, for instance, the very notable contribution of the American Gas Association in devising the "degree-day," by which we are now able to determine with a high degree of accuracy the actual heating requirements in a given locality, not only for the entire heating season, but for any given part of it. Where, heretofore, the heating load has been figured in rough percentages, the new method permits a much closer approximation and will undoubtedly become standard practice.

At the risk of reiteration, it is worth while to state again that the "degree-day," as it has been standardized by the American Gas Association, is a unit derived from the temperature difference between 65° F. (at which point it is assumed that heat is required) and the average temperature for a day or for any any other period of time. So, to compute the number of "degree-days" in one week when, let us say, the average temperature is 50° F., we subtract 50 from 65 and multiply by 7 days, giving us 105 "degree-days." By taking the average temperature readings below 65° F. for a month and multiplying this figure by the number of days in the month, we arrive at the number of "degree-days" for that month. By adding the monthly totals thus obtained, we obtain the total "degree-days" for the heating season.

TO MEET the anticipated demand on the part of the heating industry for these data in usable form, we presented last month the "Iso-Degree-Day" Chart, in which the heating requirements in "degree-days" for any part of the country and a portion of Canada may be ascertained at a glance. A further use of the "degree-day" idea, in conjunction with the "Iso-Degree-Day" Chart, has suggested itself, namely, the addition to the "degree-day" lines of the corresponding amounts of coal, gas or oil needed to meet the "heating deficiency." In other words, it is now possible to express by means of curves the average amounts of fuel that will be needed at any time and in any place to carry the householder through the heating season, depending only upon the character of his building construction and the efficiency of his heating plant. Conversely, with a given building and with a heating system in operation, we may determine very closely how efficiently the plant is being operated.

In this issue is presented the first of the "Iso-Degree-Day" Fuel Charts, pertaining to gas. This will be followed, in later issues, by similar charts on oil and coal. While these charts are calculated primarily to promote the interests of the heating industry, they will serve a further purpose and fill a long-felt want in giving both the oil and gas heating salesmen the needed data for answering the most pressing question put forward by prospective customers, namely, "How much oil (or gas) will we burn?"

New York's Municipal Building Equipped to Burn Oil

Largest Civic Building Provides Immunity Against Interruption of Its Heating Service

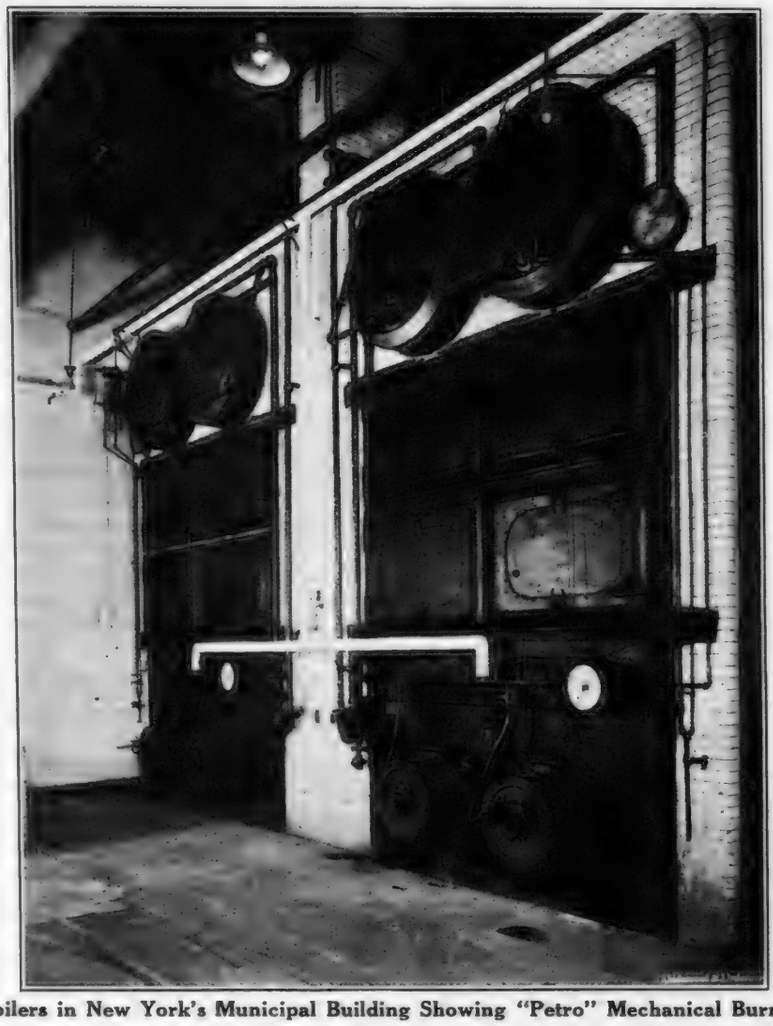
Apprehensive of recurring coal strikes that so seriously disturb the anthracite market, and with memories of the severe winters of a few years ago, when practically complete shutdowns of coal shipments into New York occurred, the Department of Public Works of the City of New York recently awarded a contract to the Petroleum Heat and Power Co., New York, to install a fuel oil storage and oil burning system in the Municipal Building.

This building is famous, not alone for its architectural and structural merits, but also for the fact that it is the largest building in the world given over solely to the administrative needs of a large city. Housing practically every department and bureau that is required to handle the civic business of New York, the building is the workhouse of thousands of city employees, and its continual operation is of vital importance.

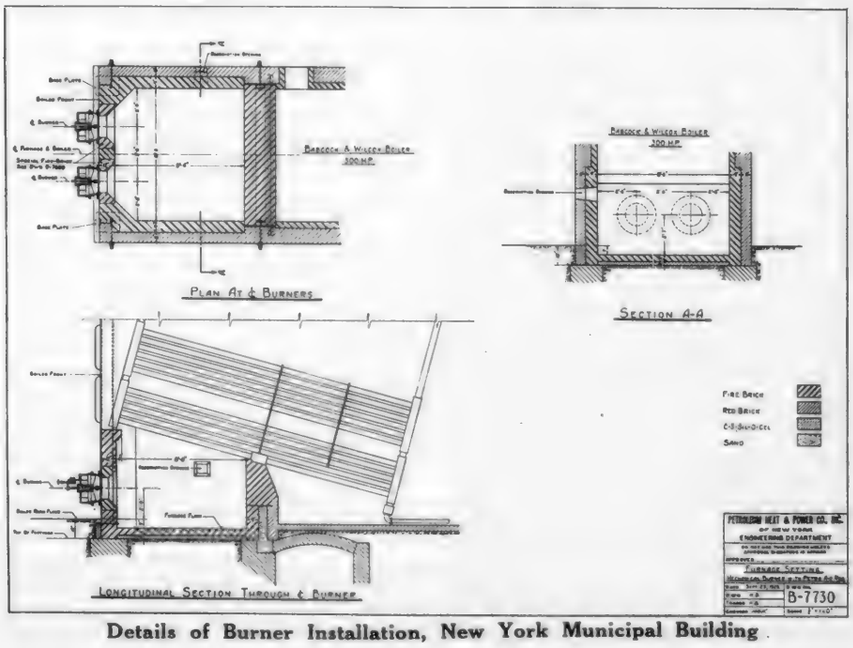
To make certain that this building would not suffer a shut-down for even a single day, due to lack of fuel for its power plant, and mindful of the splendid service record of the fuel oil distributing concerns in New York city, regardless of the severity of the weather, it was decided to install a modern fuel oil storage and oil burning system to make the building's power plant independent of the weather and of the vagaries of the anthracite market.

The power plant of the Municipal Building consists of four 300 H.P. and two 150 H.P. Babcock & Wilcox water tube boilers set in batteries.

Steam is generated at 100 lbs. pressure, and practically the entire load is reduced to 1 lb. pressure for use in the heatings mains, which feed a two-pipe vacuum system, with 74,000 sq. ft. of direct radiation. A portion of the heating is indirect, 14 fan units being installed. High pressure steam is used also for pumps that supply about 100,000 gallons of water daily for drinking and sanitary purposes. Indicating the extent of the heating load, it is said that the pump load is but 5% of the average winter demand.



Boilers in New York's Municipal Building Showing "Petro" Mechanical Burners



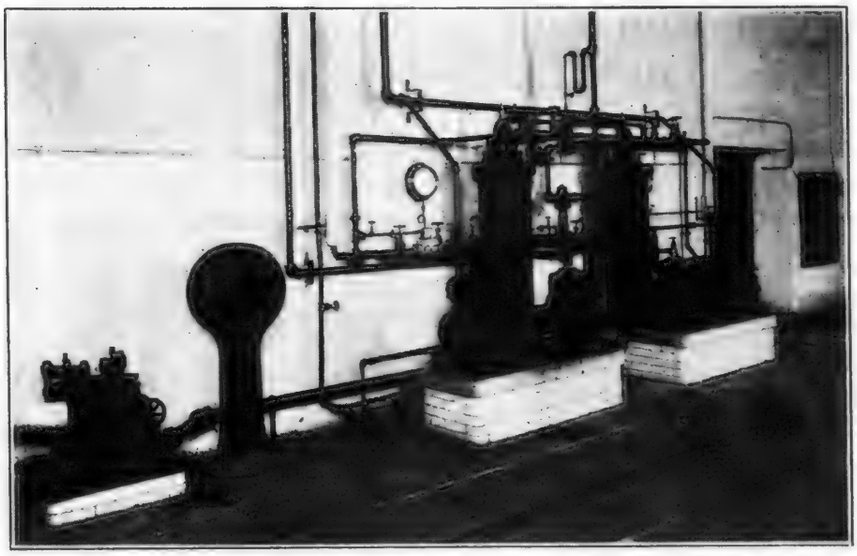
Details of Burner Installation, New York Municipal Building

The coal consumption has varied between 4 tons per day in the summer time, and peak loads approximating 37 tons during winter days, depending upon the quality and grade of coal received. The plant operates continuously and the average yearly consumption is about 4500 short tons of buckwheat coal.

The oil storage system consists of two 10 ft. diameter by 30 ft. long steel tanks, of 5/16 in. steel plates, with 3/8 in. flanged and dished heads, giving a gross storage capacity of 34,000 gallons, sufficient for a week of extreme winter weather.

These tanks are housed in separate concrete enclosures with a sand fill between the tank and floor, walls and roof of the enclosures.

Separate 8 in. fill lines run from each tank to the curb line on the north side



Instruments, and Pumps for Handling Fuel Oil, New York Municipal Building

of the building, and each line is fitted with a basket strainer and a locked fill box.

The fuel oil pumping system consists of two 8 in. x 4 in. x 10 in. double acting simplex steam pumps of large reserve capacity.

As a heavy Mexican fuel oil of approximately 14° A.P.I. is burned, preliminary heating in the tanks is provided by circulating hot water through seamless steel tube pipe coils, with welded joints, which construction eliminates any possibility of water leaking into the oil.

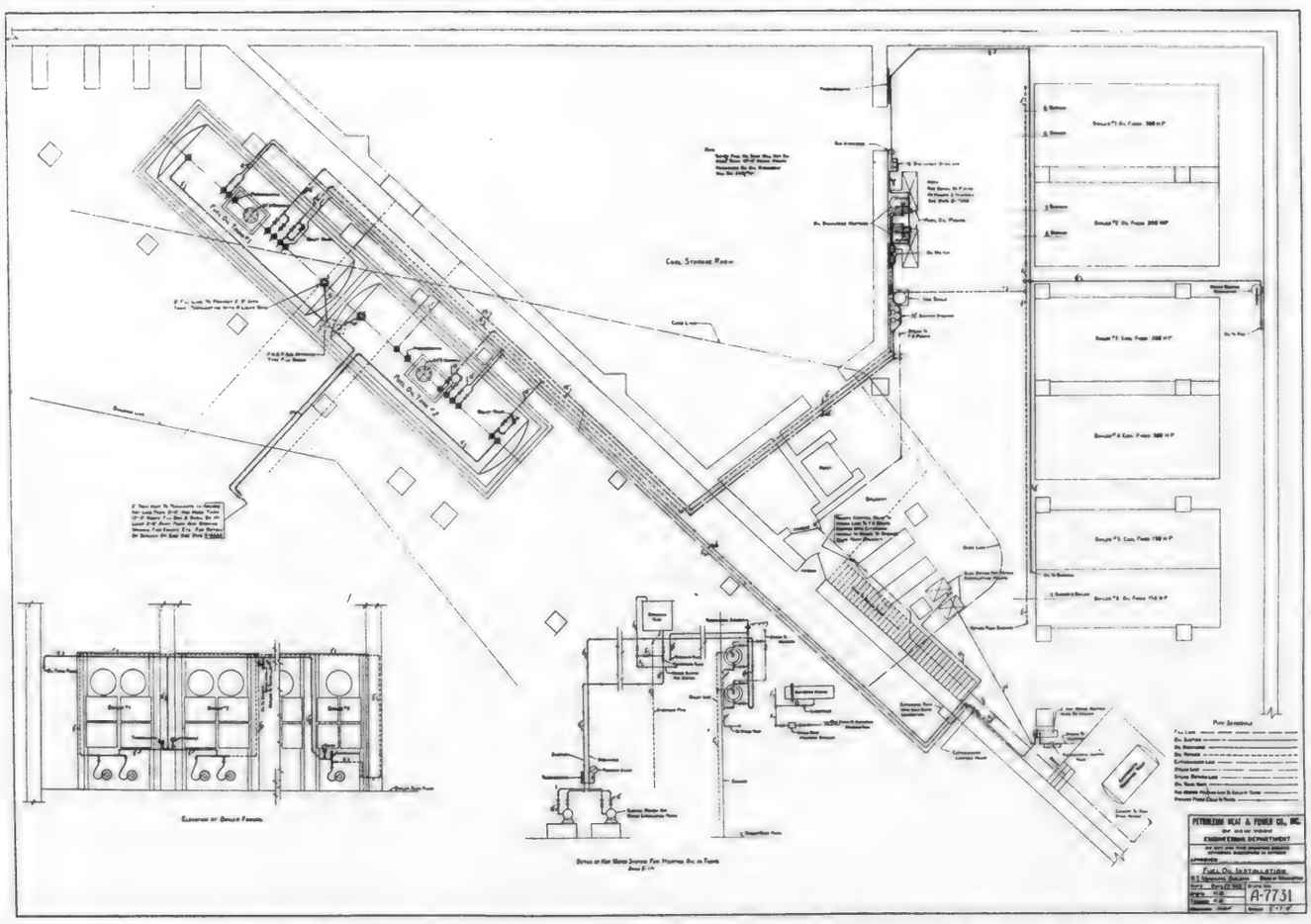
High and low suction connections are joined at each tank, and the two lines are extended to the suction strainer, where they are manifolded. Duplex suction and discharge strainers assure a supply of clean oil at the burners.

Two large coil type discharge heaters raise the oil to the proper operating temperature.

After passing through the discharge strainer, the oil is fed through an overhead line to the burners. The outside battery of 300 H.P. boilers and the outside boiler of the battery of 150 H.P. boilers were converted to oil burners, retaining the center three boilers in their original condition.

The grates of the converted boilers were removed and the furnace floor depressed. The side and rear walls of the furnaces were relined with fire brick, and new front walls and insulated floors were installed.

Each of the 300 H.P. boilers are equipped with two "Petro" mechanical burners and registers, and the small boiler is fitted with one burner and register. The registers are particularly worthy of comment in that they embody the feature of movable flame vanes. These vanes impart a whirling motion to the air drawn into the furnace by the stack draft, and the adjustable feature of these vanes permit absolute control over the shape of the flame. Various flame lengths ranging from a long, drawn out fire to a short, bushy one can be obtained by altering the angle of the vanes. This enables the operator to keep the flame off the boiler tubes and furnace walls regardless of the amount of oil being burned which tends toward



Plan of Tank and Piping Layout for Oil Storage, Municipal Building, New York

smokeless combustion and reduction of furnace repair charges.

Adjustable shutters, on the circumference of the register casing, control the amount of air passing into the furnace. Thus the operator has absolute, flexible control over both the amount of air flow to the furnace, and the shape of the flame.

Automatic regulation of the oil and air flow to the burners is obtained by a pump governor that controls the oil pressure to the burners, and a hydraulic damper regulator, actuated by the pressure in the oil discharge line, which controls the rear dampers. A sudden increase in steam demand will be reflected by a falling steam pressure. The governor, at the pumps, will open up, the oil pressure to the burners will be increased and the damper regulator, responsive to the increase in oil pressure in the discharge line, will open the boiler dampers, thus increasing the available draft. The stack, which is enclosed within the building walls, is approximately 375 ft. high, thus assuring ample draft for all ratings.

The entire installation is designed and laid out to secure maximum efficiency and economy and to afford ease of operation.

All pumps and heaters, both for the fuel oil and for the hot water circulating system, are installed with capacities well beyond that required for the plant operation. Large easy reading pressure gauges and thermometers are placed at each boiler and at the pumps. Dial type draft gauges are installed at each boiler for the guidance of the fireman.

A model "U" adjustable type Pneumercator gauge measures the oil reserve in the tanks, and a meter in the discharge line measures the oil pumped to the burners.

All lines under pressure consist of extra heavy cold drawn seamless tubing with extra heavy drop forged fittings. All hot oil and steam lines, together with the oil and water heaters, are covered with 85% magnesia pipe covering, with canvas jackets, and all circuits are painted distinctive colors to permit easy identification. The entire system, in fact, represents the best that is available in the art of oil burning today, and is indicative of the enormous progress that the oil burning industry has made in New York city. To advance, in spite of the most stringent fuel oil regulations of any city Fire Department in the world, as regards methods of installations to assure absolute safety, to a fuel oil delivery of over a million barrels a year, within the short space of four years is an indication of the rapid growth that the industry has enjoyed in New York. The use of oil for fuel in the Municipal Building, following the even larger and more famous buildings, such as the Equitable and Singer buildings, which have been dependent upon fuel oil for their light, heat and power for several years without even a semblance of danger from a shut down on account of lack of fuel, is indicative of the attitude of responsible building operators towards the subject of fuel oil.

Advantages of Welded Smoke Stacks

Some useful notes on the welding of smoke stacks are given in a report received from the Boom Boiler & Welding Co,, Cleveland, O., telling of the way the wider use of electric welding is being reflected in its own volume of business.

"Our records show," states the report, "that electric arc welding is coming constantly into greater favor on new work where the joining of metals is involved. Take, for instance, the case of stacks for commercial and industrial buildings, with the present-day assurance of a 100% welded stack job, it is logical that this method should be favored over that of riveting."

The actual first costs on a welded or a riveted stack, it is stated, are about even, but considering the efficiency of the joints in a stack, welded construction, it is estimated, gives 100% as compared to 60% in the riveted type. Breechings and gas and smoke conductors in a stack generally allow air leakage when riveted, interfering with the draft to that extent. Also joints of a stack that must be subjected to heat strains can be held tight when welded where they will give if riveted. Cast-iron, it is further pointed out, can be held securely when welded into place, but when riveted requires machining, as a rule, to secure a proper fit.

Most factories burn soft coal and when the collected soot from soft coal gets damp it forms sulphuric acid which eats into the stack. Soot also tends to deposit on projections or rough parts of the inside of a stack, such as rivet heads or seams of the riveted metal sections.

A welded stack, on the other hand, has no rivet heads or rough edges, if the welding has been properly done.

To bear out this point, Mr. Boom, the president and general manager of the company, cites a recent accident in Detroit when the top of a stack which extended 12 ft. above the roof of a 12-story building, failed in the riveted seams and fell to the street below, killing three people. The accompanying illustration shows how the acid formed by soot deposit at the riveted seams had eaten almost through the walls of the stack, particularly at the rivet holes.

New Jersey Oil Burner Dealers Organize

A score of oil burner dealers and salesmen in New Jersey have banded together under the name of the New Jersey Oil Burner Trade Association, to create co-operation between dealers, to promote the interchange of technical data, to eliminate unfair trade practices, and otherwise to work for the good of the industry. Over one hundred applications for membership have been received. Meetings are held on the first Tuesday of each month, at which invited guests of prominence are invited to speak on pertinent topics. The officers of the association are: E. A. Robertson, East Orange president; Austin Fales, Newark, vice-president; W. G. Shepherd, Newark, treasurer and W. P. Post, Jr., Montclair, secretary.

Rupture of Stack in Riveted Seams Due to Acid from Fuel Gases

Correspondence

A Combination Down-Feed and Up-Feed Water Heating System

EDITOR HEATING AND VENTILATING MAGAZINE:

I am forwarding under separate cover a set of blue-prints on which is shown a system of piping for a water heating system for the Lodder Bauer Motor Company.

I am somewhat in doubt as to how this system is going to heat and balance evenly, as you will note the display room and office are taken care of by an up-feed system of piping and storage space is heated by an overhead system of piping. As you will note, the overhead main on the boiler I have taken out on a D-connection which, I think, is the proper connection to keep the storage space from heating first. As I mentioned before, I want this system to balance.

Please check this blue-print and let us know and other subscribers, through your magazine, and under separate cover, just what this plant will do and what corrections are necessary, if any, to make it balance.

Cincinnati, O. H. N.

Blue-prints accompanying this question show a boiler installed underneath the display room at a level of 5 ft. below the storage-space level. The system is up-feed from the boiler to the display room and offices immediately above, and down-feed to the storage space at the higher level in the rear.

Return mains in the storage space are run in tile below the floor in an unexcavated space. These pipes of tile could have contained the flow mains as well as the return mains, thus making this portion of the system also up-feed. In this event, circulation could still be obtained as the boiler is at the lower level and the main could have been run directly up to the expansion tank, then extended down without covering (as a cooling leg) to the storage space in which it would feed up, thus providing a more positive circulation due to the above cooling leg, as well as more effective air removal at the expansion tank.

This method is not the best way of arranging the system, but is mentioned merely to show that the conditions do not prohibit the use of an up-feed system throughout the entire building, or, for that matter, a down-feed system throughout. In the latter case, the cooling leg would be used for the portion which is now up-feed. Numerous examples of such an arrangement have been given in recent issues of THE HEATING AND VENTILATING MAGAZINE.

A down-feed system of water heating accelerates more rapidly than an up-feed system but with a valve installed for use as a throttle in the down-feed system, one system need not unbalance the other. Incidentally, a valve in each system would do no harm and would not add materially to the cost. The "D" connection referred to is also of help in retarding the flow to the down-feed system as it takes the colder water from the bottom of the flow main at the boiler.

It should be remembered that each radiator in a water heating system is unbalanced with respect to some other at a different elevation and location. For example, suppose we have a 1½-in. riser connected to a radiator on each of three floors with 1¼-in. runout to first-floor radiator, 1-in. to second-floor radiator and ¾-in. to the radiator on the third floor. Shutting off the first-floor radiator would divert the water to the others and unbalance the system temporarily. This condition takes place intermittently in any system, yet the system will continue to work satisfactorily as we all know.

This is an illustration of unbalancing in a more moderate degree than in the case under question, but serves to show that no part of a water heating system is in perfect balance with the other portions of the system. Of course, the arrangement under question is one that is not commonly used and better to avoid where practical to do so, nevertheless the proposed system with the slight changes as advised should heat as desired throughout.

All Coming Under the Head of Editorial Service

EDITOR HEATING AND VENTILATING MAGAZINE:

I enclose a clipping from the *Philadelphia Bulletin* on "Radio Cooking":

RADIO COOKS EGG ON ICE

ETHER WAVES AT FAIR ALSO LIGHT A BULB THROUGH MAN'S HEAD

New York, Sept. 17.—Cooking an egg over a cake of ice, by wireless, was one of several demonstrations of mysterious radio power given at the Radio World's Fair.

The egg was placed on a frying pan on the ice. In a moment the pan became red hot through action of waves that penetrated the ice. The egg soon was cooked to a turn. The trick was done through the so-called wireless lamp, the inventor of which also lit the bulb through a man's head.

As radio heat is almost at our doors, won't you give in THE HEATING AND VENTILATING MAGAZINE, details of the cooking theory, as best you can? All that is wanting is what the theologians call the "nexus" to have us twiddle our thumbs towards the coal pirates. Ample power is undoubtedly all around us to heat the entire world if we had a driver and harness to fit, so we can utilize it.

Philadelphia, Pa. JOHN GORMLY

Vacuum-Vapor Versus Gravity Steam for Garage Heating

EDITOR HEATING AND VENTILATING MAGAZINE:

I have been asked to install a steam heating system in a garage and would like to know the best method to use.

Is the vacuum-vapor system better than the ordinary steam heating system? I would also like to know which is the better method, to bring each return separate back to the boiler, make a false water line or put a check valve on each return and connect them together.

I have looked over the heating in a number of garages which make use of the last method and I believe them to be failures.

Paterson, N. J. JOHN KNOWLES

The comparative merits of a vacuum-vapor system versus a gravity steam heating system for a garage are generally conceded to be in favor of the former type of system when such a system is made up of equipment that fulfills its designated name.

It is assumed that the garage building in question is a public garage having 3,000 (or upward) sq. ft. of floor area, as a private garage or a semi-private garage would not be entirely suited to a separate vacuum-vapor installation. Buildings of the latter type are usually heated from a near-by boiler plant or by means of a simple assembled heating plant made adaptable for the purpose.

In the case of a public garage, maximum inside temperature is required at night when all cars are stored therein, at the time when very little attention can be given to the boiler as compared to the daytime, so that a heating system maintaining heat over a long firing period would be more advantageous. This is accomplished with a vacuum-vapor system, as such a system may be operated under a vacuum when fires are banked; in other words, steam may be circulated throughout the system and the radiation heated thereby even when the fireman is absent. During the day when the garage is practically emptied of cars, temperature is not an important item and it should be remembered that during this time the outside temperature varies from 10° to 20° above that of the temperature throughout the night.

Ideal circulation is seldom if ever obtained in a gravity system even when a single connection is made to the radiators and the heel of each riser *dripped into a wet return, or again, as is

often done in a two-pipe job, with the use of a check or globe valve on the return end of each radiator. Trouble is usually experienced with the former method due to pressure drop and if radiators are lengthy, water hammer and air binding will develop due to counter currents of steam and condensation, thereby making a portion of the radiators ineffective. With the latter method short-circuiting is experienced from one radiator to another, causing air binding. With either method, one-pipe or two-pipe connections to radiators, it is usually necessary to install a false water line at the end of the return in order to make the return wet, and thereby minimize noise and the other troubles cited above. This practice often results in freezing of the water retained in the return line, particularly so because of the false seals which are usually made near the front of the building where large doors are located and where the most favorable location occurs for the installation of the boiler room.

A vacuum-vapor system, using thermostatic traps at the end of each radiator, will eliminate air binding and water hammer and permit of smaller connections to radiators, as well as smaller return piping. The return of condensation is benefited through the absence of steam in the return line and the fact that there is a considerable pressure differential maintained between the supply and return.

As to comparative costs, it can be safely said that for a vacuum-vapor installation in a garage having about 5,000 sq. ft. of radiation, the cost would not vary materially from that of the ordinary gravity system. This can be understood when the cost of all radiator valves for a gravity system, plus cost for extra-size piping and false water lines or other seals, as well as labor thereon, is balanced against cost of the specialities to make up a vacuum-vapor system. In both cases the required total radiation and boiler size are the same. Even in somewhat smaller jobs where there would be a nominal difference in favor of the gravity system the advantages and economy of a vacuum-vapor system would more than justify the added expense, economy in this case meaning the economy obtainable when fires are banked or when the temperature of the radiating surfaces is lowered as outside temperatures increase.

Regarding the false water line previously referred to, this is usually preferred to a wet return, because of the saving thereby of valuable floor space, the location of doors which interfere with a return at the floor, or because of various other reasons. It does away, of course, with the long return drops as would necessarily be used with a return at floor level. If a false water line is not used, the return from each radiator may be sealed by dropping below the water line to a wet return, or by using drip loops before connecting to a dry return. Always seal the steam from the return side of the system in some such manner as above. This applies to each drip and return riser or connection where the steam heating system is not a vacuum-vapor installation. In the latter case, the thermostatic traps form seals in themselves and no other seals are required.

Separate connections are not used in steam heating installations of any type, and only in the case of certain radiators are they used on water heating jobs. Garages are often heated by means of water, instead of steam, because the established grades may not permit a gravity return of the condensed steam.

T. W. REYNOLDS

*This does away with radiator condensation in the steam main, making it possible to reduce the size of main as radiator branches are taken off. Smaller branches may be used and the main run much closer to the ceiling, an important item where headroom or space below is required for other purposes.

A Legal Question About Domestic Water Service Heaters

If possible kindly answer this question. If the law says that plumbing fixtures and piping for sewerage require approval by the proper authorities, is the connecting of a domestic hot water boiler to a steam boiler, furnace or gas water heater, a plumber's or a steamfitter's job?

Harrisburg, Pa. R. E. DUFFY.

Union requirements are that this work shall be installed by the plumber if it is included in his contract, or by the steamfitter if it is specified as a part of his contract. As for sanitary requirements, there are none, for the domestic heater is in no way connected with sanitation. No plans have to be filed with the plumbing authorities having jurisdiction, either for its installation, relocation, removal, or necessary connections.

T. W. REYNOLDS.

Favorite Trade Expressions—What Do They Mean?

EDITOR HEATING AND VENTILATING MAGAZINE:

So-called "modulated" and "controlled" heating systems are favorite expressions in the terminology of the industry. But, frankly, what do they mean? In other words, what should we expect, for instance, of a thing that is "modulated?" Should we expect to modulate it ourselves? Of course, a "modulated" system is not advertised as "automatically modulated," but, I repeat, are we expected to modulate such a system ourselves?

"Controlled" is a more recent expression. Applied to heat it would manifestly mean controlled heat, but does it mean for all conditions or is this heat controlled for only one condition? Engineers know, of course, that it means but little more. A modulation valve does not make modulated heat nor does a control valve mean controlled heat. In both cases a modulator or controller is required to fulfill the terms used and only those concerns who make a thermostatically or otherwise controlled valve fulfill these terms with their own devices and they are alone entitled to use the designations mentioned if the English language is going to continue to mean anything.

There is still another question which, to my mind, explodes the whole idea of modulation from a practical standpoint and leaves it away up in the air as pure theory. The writer made an experiment some time ago to determine how small an inlet hole could be in area to supply a 50-sq. ft. radiator on a two-pipe vapor heating system. This orifice was 5/16 in. in diameter and supplied 302.73 cu. ft. of steam per hour at a velocity of 158 ft. per second. The drop in pressure through the orifice working under these conditions was estimated at 2 oz., with 4 oz. pressure at the boiler which was 100 ft. distant from the valve. The area of this orifice is 0.0767 in. Compare this with the area that is open for the flow of steam through a ½-in. modulating valve when the valve is barely raised from its seat, leaving a 1/31-in. clearance between the valve and the seat, which is 0.05398 in.

The difference between these areas is exceedingly small and a slight increase in the boiler pressure would suffice to overcome this small difference, thus making this ½-in. modulating valve capable of supplying sufficient steam to a 50-sq. ft. radiator when the valve handle has been moved a very much shorter distance than any user would ever contemplate moving it with the expectation of getting heat.

The result of these facts, which is my point, is that in practice a modulating valve is incapable of modulating the flow of steam.

The foregoing argument ruins the practical application of the modulating theory because of mechanical difficulties. However, this is probably the least of the arguments against its practicability. While the dial may be properly calibrated for one certain set of conditions, it must be apparent that the pressure within a system varies constantly, while the demands for steam at the various radiators varies even more. Is there any hour of the day, for instance, in which there is not some change in the weather, not alone in temperature but in wind velocity, wind direction or movement of the sun, etc.? Suppose that it were mechanically possible to perfectly control the conditions within a system and suppose it were mechanically possible to construct a modulating valve

with the smallest imaginable free area for the flow of steam with a corresponding handle movement sufficient for the operator to know that he had moved the valve from its seat, I say, if all these things were allowed, would not the weather conditions make it impossible for the occupants of the office or house really to control the temperature within unless they gave up any idea of attending to other business?

This statement is very well substantiated by the tests made with thermostatically-controlled supply valves which operate at least once an hour under the best of conditions in an effort to keep a steady temperature in the room. Suppose that the occupant of a room were willing to leave off whatever he was doing once an hour to modulate the radiator valve, how much would he open or close it?

And, for the last statement of a practical fact, I would say that 90% or more of the people using direct radiators for heating open the valve wide when they are cold and close it altogether when they are warm, not even attempting to regulate the valve in any intermediary position.

I reiterate my contention with these supporting arguments or statements of fact, that modulation or regulation of the room temperature by hand is pure theory and not applicable to practice. For the sake of accuracy and justness to all, manufacturers certainly should not assert that their systems automatically control the amount of heat given off by a radiator, when it is extremely doubtful if this control could be achieved by the utmost attention of an intelligent person.

Brooklyn, N. Y. G. D. C.

Why Should Points of Heat Supply Vary With Different Systems?

By T. W. Reynolds

A CURIOUS inconsistency in heating and ventilating practice is the variation in the points of heat delivery with different heating systems. Take, for instance, the gravity warm-air furnace heating system as compared with direct steam. In one case we have warm-air ducts built preferably with short runs leading to registers located almost invariably near the inside walls. In the other case we have direct steam radiators located, as far as possible, near the outside wall and directly beneath windows.

If the outside walls is the correct location for the heat supply, then it is manifest that warm-air registers along inside walls represent poor practice. This practice, as everyone knows, is controlled by other conditions, such as the slight motive head for the circulation of the heated air. This motive head is further decreased by the resistance of the longer runs, loss of heated air by leakage and loss of heat in transmission. But the fact remains that the "inside location" is just as wrong for warm-air registers as it is for direct radiators.

As a writer recently put it, "the location of the radiator is very important in order to secure the highest radiator efficiency and make it comfortable for the occupants in the room. When a radiator is placed along an inside wall there is a tendency for uncomfortable drafts to be formed by the cooling effect of the windows and outer walls upon the air in the room. The cold air currents from these walls flow downwards without interruption to the floor and then across the floor to the radiator."

As is well known, difficulties are experienced at once when it is attempted to distribute the warm air from registers across the room to the outside cooling surfaces, especially when the wind is blowing against that side. Under such conditions, even in a mechanical ventilating system, there is a certain amount of air infiltration. Yet in warm air furnace literature we read that the warm air delivered through the registers rises toward the ceiling, heating the room from above downward, and forcing the cool impure air out through crevices at doors and windows.

In hotel work the architect frequently wants the draperies to hang without touching the radiators, which may mean a three or four-column unit in order to give the required heating surface. Here we find that radiators are objectionable when located under windows. In other cases the architect may want the space under windows to be free from radiation so that one may sit close to the window. In such cases, where the radiation required is not greater than the space under the window, wall radiation can be used to advantage. It is an interesting fact in this connection, often overlooked, that wall radiation is 25% more efficient, so that less radiation is required. Again, a radiator may often be placed at right angles to a window along some adjacent wall.

University of Tennessee Has New Heating and Power Plant

A new central heating and power plant has just been completed for the University of Tennessee, at Knoxville, at a cost of $170,000. This is the first central plant of the kind in Knoxville, and it has attracted considerable attention. Steam is piped to practically all of the buildings of the university, and will be used for cooking and laboratory work, as well as heating.

About five miles of mains have been put down; and, according to Dean Ferris, of the engineering department, the transmission efficiency will be over 90%. The longest run of pipe is about five-eighths of a mile. In the heating plant all boilers, stokers, pumps and auxiliary machinery are in duplicate, and provision has been made for the installation of additional units as the university grows.

A 200-ft. stack with an inside diameter of 8 ft. establishes a new landmark for Knoxville. The new installation will result in greatly increased fuel economy, as the buildings have been heated by individual or small group installations, some of the boilers being 30 years old. Substantially one-quarter of the entire cost of the plant covers the underground system, which has been very carefully designed. Each conduit carries a high-pressure and a low-pressure steam line, and a return.

The new building is three stories in height, two being below ground. It is built entirely of concrete, brick and glass, and is finished inside with Tennessee marble, which was cut and fitted by the students of the engineering department.

Oil Traffic Signs

How the use of oil for fuel is making its presence felt in the life of the community is indicated by the special signs that are being placed in some of the city streets to enable tank trucks to deliver fuel to power plants. At the heating plant of the Great Warehouse Power Company, in San Francisco, for instance, which is located in the downtown section, the storage supply for oil is such that it is necessary to deliver a tank load every ninety minutes during the day.

Special Traffic Sign Used in San Francisco, Necessitated by Limited Oil Storage

For the purpose of keeping automobiles from parking near the intake, special traffic signals have been installed

Iso-Gas-Consumption Chart

(Based on The Iso-Degree-Day Chart, Published as a Supplement of The Heating and Ventilating Magazine for September, 1925)

In the derivation of data from which these lines were drawn, reports of the U. S. Weather Bureau from nearly 500 stations, and covering a period of fifty years, were used, and as many points plotted. The list, as printed on Data Sheet No. 5, has been shortened, to eliminate points of little importance, except as used to locate the lines. Over 12,000 calculations were required to make possible the presentation of this chart. Figures in circles designate cities, which are listed on Data Sheet No. 5.

P. E. F.

Assumptions

Figures on contour lines represent total gas consumption in cubic feet necessary to supply heat for 1 sq. ft. of steam radiation, for one normal heating season, based on the following assumptions:

Heating value of gas, 1000 B.T.U. per cu. ft.

Efficiency of heating unit, 100%.

Figures are gas consumption per sq. ft. of steam radiation.

For water radiation, multiply gas consumption for steam by ⅝.

Calculations are based on radiation figured for 0° F. outside temperature, and 70° F. inside temperature.

If consumption is desired for radiation installed for:

—10° F. outside temperature, multiply by 7/8.

+10° F. outside temperature, multiply by 7/6.

+20° F. outside temperature, multiply by 7/5.

Gas consumption for any intermediate degree-day value may be found by interpolation.

Degree-Days for Measuring Heating Requirements

"Degree-Day" is a clever word-coinage, designating a unit by which heating requirements may be measured, and comparisons made between heating loads under different climatic conditions or at different points. *It is the product of a degree of temperature, and a time factor of one day.* In common with nearly all units, an empirical element is necessary, this being the zero point in the computations. So the American Gas Association, the source of the "d.d." unit, through a study of actual conditions, determined that the minimum temperature of bodily comfort in the home is reached when the mean daily temperature falls below 65° F. It must be borne in mind that, with a daily *mean* temperature of 65° F., the day-time temperature will average around 70° F., and the only time room temperatures would be below the comfort point would be around midnight. This explains the derivation of this arbitrary figure.

Manifestly, for each locality there may be determined the number of days of the year for which the average temperature is below 65° F. This period may be called the heating season.

If, then, we have a mean daily temperature of 60° F., it is evident that, for this day, we can measure the heat requirements by the figure "5°-days," whereas, had the mean temperature been 55° F., the heat requirement would be measured by "10°-days," or would be twice as great.

Summing up, therefore, for a week, or a month, or a heating season, we may express the aggregated heating load of any locality in units that permit comparison with that of any other point. Likewise, we may compare the heating requirements at any given place, during one heating season, with those of any other heating season. And so a "mild winter" or a "hard winter" becomes definable in accurate units that may be translated into B.T.U. Basing these units on the very accurate data of the weather bureau over a period of fifty years, a high degree of accuracy results.

The Iso-Degree-Day Chart

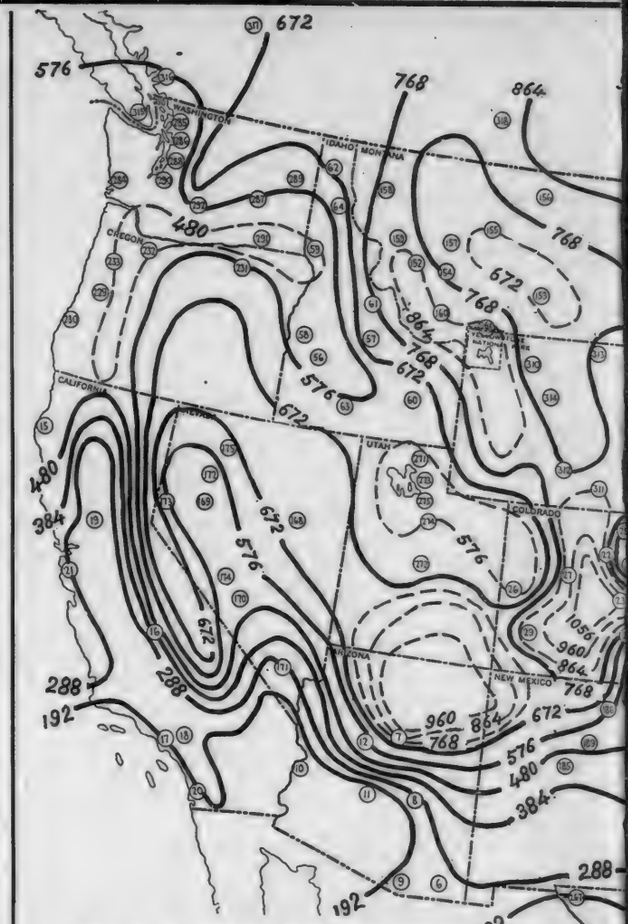
It would seem but logical to extend the usefulness of the "degree-day" unit by cohering the individual data in graphic and easily applied form.

This amplification has been developed along the lines of the charts furnished by the United States Weather Bureau, and, adopting simi'ar nomenclature, the result has been designated an "Iso-Degree-Day Chart."

Calculations were made for over five hundred cities and towns, on the basis of weather bureau averages taken from fifty years' observations. With these figures noted on a map of the area under consideration, it becomes possible to draw lines across the map, representing equal heat requirements. These lines have been drawn to represent degree-days in multiples of 1000, and, roughly, nine lines cross the United States. Those in Canada are deduced from data supplied by the Dominion Metereological Service.

The general trend of the iso-degree-day lines throughout the eastern part of the country does not counter popular conception, but as soon as the eastern slope of the Rocky Mountains is approached, the influences of great natural factors is felt, and the failure of the lines to follow the extension of their general mid-continent direction is disconcerting, to say the least.

The iso-degree-day lines on both



Figures on contour lines, representing total gas consumption per normal heating season, may be converted to degree-days on the following evaluation:

Gas Consumption	Degree-Days	Gas Consumption	Degree-Days
576	6000	96	1000
672	7000	192	2000
768	8000	288	3000
864	9000	384	4000
960	10000	480	5000

The Iso-Gas-Consumption Cha

In making specific application of the Iso-Degree-Day Chart to the uses of the gas industry, to the end that there may be provided simple and reasonably accurate methods of determining gas requirements for domestic heating, recourse is had to the excellent basic data developed by the American Gas Association.

It will be apparent that the chart here presented is identical with the Iso-Degree-Day-Chart except that the degree-day figures have been replaced by figures representing the quantity of gas required to provide for 1 sq. ft. of steam radiation on that line.

Obviously the calculations entering into these deductions are based on certain assumptions.

It is assumed that the gas had a heating value of 1000 B.T.U. Far from being taken as a criterion, or average, this figure was selected solely because it permits ready, and almost mental conversion to whatever heating value it

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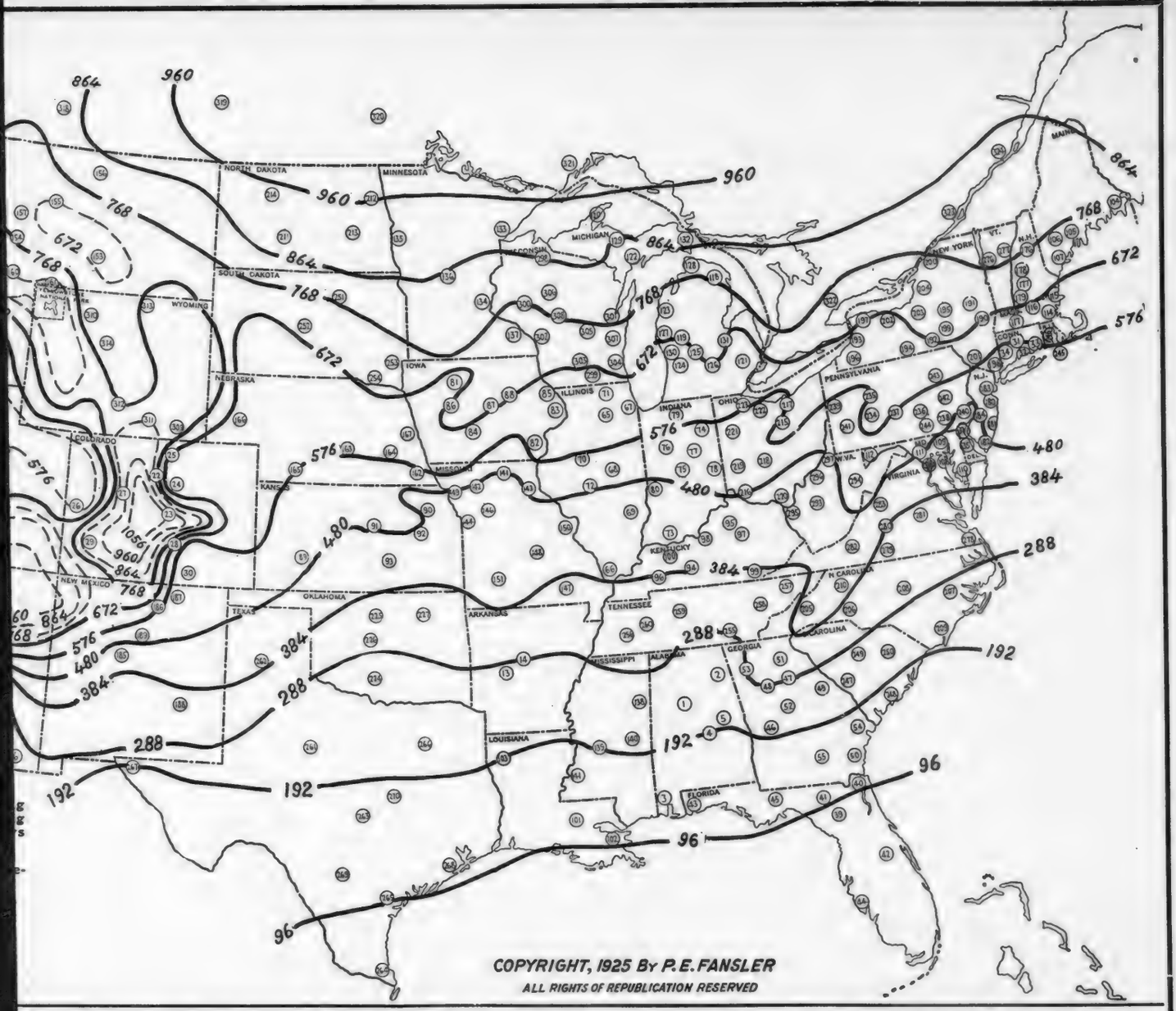


slopes of the western mountains have been so located that they follow very closely the actual climatic conditions resulting from the prevailing winds and topographic features of the region.

sumption Chart

may be desired to use. If local gas contains 500 B.T.U., unit radiation requires twice the quantity taken from the chart.

It is assumed that the heating efficiency of the heating equipment is 100%. Again the figure is selected for ease of computation. Assumptions of efficiency of a particular installation may be made with high accuracy, and a simple ratio used to increase the figures computed on the basis of perfect efficiency.

It is assumed that calculations for the installed radiation were made on the basis of 0° F. temperature outside and 70° F. inside. If other temperatures were used, correction should be made as indicated.

It is assumed that, for steam heating, 240 B.T.U. per hour are radiated from unit area of radiation; for water heating, 150 B.T.U. per hour.

As an illustration of the ease with which problems in gas heating may be solved through application of these data, and showing the accuracy that may be expected, the following is the determination of gas requirements for Chicago.

We will start with the hypothesis that Chicago has 6,000 degree-days. (From the table accompanying the Iso-Degree-Day Chart we find the exact figure to be 6007).

Then we have, taking the gas consumption figure from the line which is identical with the 6,000 degree-day line, as 575:

Assumed B.T.U. per Cu. Ft.	Assumed Efficiency, per cent	Assumed outside temp.	Assumed inside temp.	Assumed Type of Radiation	Cu. Ft. Gas Per Sq. Ft. of Radiation
(a) 1000	100	0° F.	70° F.	Steam	575
(b) 535	100	0° F.	70° F.	Steam	1075
(c) 535	85	0° F.	70° F.	Steam	1265
(d) 535	85	—10° F.	70° F.	Steam	1107
(e) 535	85	—10° F.	70° F.	Hot Water	692

which is the normal figure for Chicago, for the assumed conditions.

These figures are obtained as follows:

Allowing for B.T.U. in Chicago gas,
$(b) = (a) \times 1000/535$

Allowing for furnace efficiency of 85%,
$(c) = (b) \div .85$

Allowing for radiation figured at —10° F.,
$(d) = (c) \times 7/8$

Allowing for water instead of steam,
$(e) = (d) \times 150/240$

But, let us carry the problem one step more, and assume that, for a particular year, the heating load varied from the (normal) 6,000 degree-days, and was 6,150 degree days, which was the heating load in Chicago, for the winter of 1924-25.

Then, for that heating season, the gas consumption would have been 6150/6000 x 692, or 709.3.

Now, as a matter of fact, taking the actual meter readings of a large number of Chicago homes that were heated during the 1924-25 heating season, as recently published in THE HEATING AND VENTILATING MAGAZINE, adding them together and dividing by the actual connected radiation in these homes, we find that it actually required 706.8 cu. ft. of gas to supply heat to 1 sq. ft. of this radiation. Thus the *computed* gas consumption, 709.3 cu. ft., varies from the *actual* consumption, 706.8 cu. ft., by only 1.5 cu. ft., or less than 0.2%. This represents, for an average house having 750 sq. ft. of radiation, about 1,000 cu. ft. of gas per heating season or less than $1.00 in the season's heating cost.

as shown in the accompanying illustration.

One of the signs says "No parking—Oil intake," and the other says "For Oil Tanks Only—No Parking."

Recently an oil truck was kept from getting close enough to unload oil for over an hour because of the parking of cars near an oil intake. This almost caused a shut-down of the plant.

New York University's Course in Heating and Ventilation

Through the Evening Engineering Section, New York University offers a special three-year course in Heating and Ventilating. This course is intended to meet the needs of those already engaged in the field of industry, but who desire a fuller knowledge of the engineering principles upon which it is founded. The course should appeal to men working in the offices of heating and ventilating engineers, contractors, manufacturers of heating and ventilating equipment, and architects, as well as to those engaged in the actual work of manufacturing or installing heating and ventilating systems.

The subjects are so arranged that men with only an elementary school training may pursue this course. Students demonstrating a satisfactory knowledge of some of the subjects of the course may be excused from such subjects. It may thus be possible for some students to shorten the length of time required for them to secure their Certificates.

For the satisfactory completion of this course, a Certificate in Heating and Ventilating will be granted.

The program for this course will be as follows:

	FIRST YEAR
E. D. E-11	Mechanical and Freehand Drawing
Math. E-5	Practical Mathematics—A
H. V. E-1	Elements of Heating Systems
	SECOND YEAR
Math. E-6	Practical Mathematics—B
H. V. E-2	Elements of Heat
	THIRD YEAR
Chem. E-1	Elements of Chemistry
H. V. E-3	Heating and Ventilating
H. V. E-4	Heating and Ventilating Estimating.

The cost per year for this course, complete, except for books, slide rule, drawing instruments, etc., but including University fees, is $133.50 for the first year and $140.00 for each of the two following years. If a student does not desire or need to take all the subjects of this course, he may pursue just those for which he may be prepared. The fees for each subject are indicated after the description of the subject. A University fee of $5.00 per term is charged each student taking this complete course.

For those taking the complete course, a payment of $70.00 should be made at the time of registration. The balance, $63.50 for the first year, or $70.00 for each of the other two years, is payable not later than the first Monday of the following February. Where a student finds it too burdensome to pay $70.00 at once, he may make an initial payment of $35.00, provided he gives evidence of good faith in his intention to make all his payments. The balance on the first term fee, $35.00, will be payable not later than the first Monday in December. Where extensions are granted on second term payments, such balances are due not later than the first Monday in April.

The descriptions of the subjects of this course are as follows:

Chem. E-1. Practical Chemistry.—This course covers sufficient elementary inorganic chemistry to enable the student to understand fundamentals of chemistry, and its application to iron, steel, corrosion, water, fuels, air, gases.

Lectures. 60 hours (2 hours a week, both terms), Thursday, 6-8 p.m., at University Heights.

Fees. Tuition, $30.00.

Credit. Only toward H.&V. Certificate.

E. D. E-11.—Mechanical and Freehand Drawing. Lettering, use of instruments, conventional symbols, working drawings, tracings, blueprints. Elements of perspective, technical sketching. Drawing: 90 hours (3 hours a week, both terms), Thursday, 7-10 p.m., at University Heights, Sage Laboratory.

Fees: Tuition, $22.50; Laboratory, $1.00.

Credit: 2 points; also toward H. & V. Certificate.

H. V. E-1.—Elements of Heating Systems. This is a lecture and laboratory course covering the fundamental equipment used in warm air, hot water and steam heating systems. Pipe, valves, fittings, methods of making up piping are discussed in the class room, and the actual work is done in the laboratory. Warm air furnaces, ducts, hot water boilers, steam boilers, radiators and necessary accessories are described and their installation and operation discussed.

Lectures: 60 hours; Laboratory: 60 hours (4 hours a week, both terms), Tuesday, 8-10 p.m., (lectures) at Washington Square, and Friday, 8-10 p.m., (laboratory) at University Heights.

Fees: Tuition, $60.00; Laboratory, $10.00.

Credit: Only toward H.&V. Certificate.

H. V. E-2.—Elements of Heat. This course covers the elementary theory of heat temperature, specific heat, heat transfer; conduction, radiation and convection, mechanical theory of heat; heat units; theory of vapors—steam and its production pressure and temperature relations, steam tables; heat transfer—transmission coefficients for building materials, radiators, etc.; circulation of air, steam and hot water. In the laboratory, the practical work started in H. V. E-1 is continued.

Lectures: 60 hours; Laboratory: 60 hours (4 hours a week, both terms), Tuesday, 6-8 p.m., (lectures) at Washington Square, and Friday, 6-8 p.m., (laboratory) at University Heights.

Fees: Tuition, $60.00; Laboratory: $10.00.

Credit: Only toward H.&V. Certificate.

H. V. E-3.—Heating and Ventilating. In this course, the problems met with in the design of heating and ventilating problems are taken up—the calculation of the heat losses from buildings and for ventilation; the determination of the type of heating system to be used; direct and indirect systems; calculation of radiating surface needed; auxiliary equipment, as valves, temperature regulators, traps; boiler accessories, as alarms, pumps, water level indicators, etc.; piping; pipe covering; ventilation problems; air conditioning; fans and duct work, calculations; laws and regulations governing ventilation; operation and maintenance; costs; use of exhaust steam; district heating; electrical heating; special problems relating to the heating and ventilating of public buildings, as stores, churches, schools, theatres, hotels, factories, etc. In the laboratory part of this course, the student gets practice in the testing of heating and ventilating equipment, as complete heating systems, direct and indirect; fans; boilers; radiators; traps; etc. In addition to this, part of the laboratory time is devoted to the layout of a heating system and the preparation of plans.

Lectures: 60 hours; Laboratory: 60 hours (4 hours a week, both terms), Monday 8-10 p.m., (lectures at Washington Square, and Thursday, 8-10 p.m., (laboratory) at University Heights.

Fees: Tuition, $60.00; Laboratory: $10.00.

Credit: 6 points (for M.E. E-72) and toward H. &.V. Certificate.

H. V. E-4.—Heating and Ventilating Estimating. This course covers the reading of heating and ventilating plans, the determination of materials and labor required, the preparation of specifications, and the formulation of estimates and bids. Some fundamental principles of contracting will also be discussed.

Lectures: 60 hours (2 hours a week, both terms), Monday, 6-8 p.m., at Washington Square.

Fees: Tuition, $30.00.

Credit: Only toward H.&V. Certificate.

Math. E-5.—Practical Mathematics—A. This course covers the fundamentals of arithmetic, and the elements of algebra.

Lectures: 60 hours (2 hours a week,

both terms), Monday, 6-8 p.m., at Washington Square.

Fees: Tuition, $30.00.

Credit: Only toward H.&V. Certificate.

Math. E-6.—Practical Mathematics—B. This course covers further uses of algebra, some plane geometry, and some trigonometry; logarithms and use of the slide rule.

Lectures: 120 hours (4 hours a week, both terms), Monday and Thursday, 8-10 p.m., at Washington Square.

Fees: Tuition, $60.00.

Credit: Only toward H.&V. Certificate.

Heating and Piping Contractors' National Association

Directors and Secretaries Meet in New York

The meeting of the board of directors of the Heating and Piping Contractors' National Association and the conference of secretaries of local associations were both well attended and the work done will be of value to heating and piping contractors throughout the country. The board of directors met at national headquarters, 50 Union Square, East, New York, September 14-15.

Harry M. Hart of Chicago, chairman of the board of directors, William H. Driscoll of New York, Horace W. Jones of Rochester, N. Y., John S. Jung of Milwaukee, Walter Klie of Cleveland, Frank A. Merrill of Boston and R. Templeton Smith of Pittsburgh were present.

During the summer months national headquarters obtained the opinion of boiler and radiation manufacturers on resolution II, passed at the Detroit convention, referring to the cleaning and painting of radiators and cleaning of boiler sections and resolution V referring to the elimination of the steam type radiator.

After considering these replies the board of directors decided to refer the matter of painting radiators at the factory to the National Boiler and Radiation Manufacturers' Association for consideration of ways and means of making this an accepted trade practice.

The elimination of the steam type radiator was laid over pending the investigation of certain technical questions which have arisen during the discussion of this subject. The tests are to be made in the Research Laboratory of the American Society of Heating and Ventilating Engineers.

Walter L. Fleisher of New York, chairman of the committee on standardization, had a conference with the board of directors on the work of his committee. Mr. Fleisher told of what his committee has been doing in formulating standards and emphasized the necessity of every member working to establish those standards which have been adopted by the national association.

The next meeting of the board of directors will be held at national headquarters, November 30 and December 1.

Fifteen secretaries gathered at national headquarters and spent two days exchanging ideas about how to run a local association.

C. W. Sisson of Boston, Thomas A. Novotney of Buffalo, Louis T. Braun of Chicago, A. Bachman of Cincinnati, A. R. Herske of Cleveland, George S. Clarke of Detroit, N. W. Lunda of Memphis, E. A. DeLaruelle of Milwaukee, Harry Geiser of Newark, Henry B. Gombers and Joseph C. Fitts of New York, M. G. Sellers of Philadelphia, J. B. Walker of Pittsburgh, Thomas Gale of St. Louis, D. Cady Fulmer of Syracuse and John B. Hill of Washington attended the meeting.

Among the topics discussed were:

Association procedure; Certified heating; Relations with labor; Relations with general contractors; Relations with manufacturers and jobbers; Partial payment plan; Co-operative advertising; Official bulletin; Trade Extension Bureau; Research Bureau; Surveys; Meetings—when held; Attendance; Profits—how to secure them; Chimney sizes; Apprenticeship.

J. B. Walker of Pittsburgh was chosen president for the ensuing year and A. R. Herske of Cleveland was made secretary of the conference.

It was decided to hold the next conference of the secretaries of local Heating and Piping Contractors' Associations at Evansville, Ind., at the time of the secretaries conference of the Trade Extension Bureau.

Frank A. Merrill, president of the national association, talked to the secretaries and told them what the national association is doing for the heating industry. Mr. Merrill emphasized the great advantages to be gained through standardization, pointing out that this association has already standardized the methods of figuring radiation and was now busily engaged on the matter of selecting boilers. He urged the secretaries to work for the universal adoption of one national standard so that confusion arising from local standards would no longer exist.

How to train steamfitters was discussed by E. L. Bowman, director of the apprenticeship service department of the National Trade Extension Bureau, before a joint meeting of the board of directors and the secretaries of local chapters, on September 14th.

Mr. Bowman urged that a national program of training certified steamfitters' helpers be worked out instead of leaving the education of the young man so much to chance. The necessary steps in building up such a program were discussed and Mr. Bowman offered the co-operation of his service department in accomplishing this work.

The membership committee was completed by the appointment of Charles Schneider of New York as chairman of Zone 2 and Mortimer L. Crowell of Cleveland as chairman of Zone 4.

A Propaganda Boomerang

The executive of an oil burner manufacturing company has furnished an interesting example of anti oil fuel propaganda that did not work out as was anticipated. It seems that a gentleman in a New England city had been looking into the oil-burning question. His interest had lagged considerably, when it was aroused by the receipt of a circular from a local coal dealer who happened to be a friend of the gentleman in question. The circular re-aroused his interest in oil, and he reasoned that if the coal companies were beginning to counter-attack the oil burner campaign, there must be something worth while about the oil burner. He immediately took the aggressive; within a week had inspected several oil burners in operation, and before the coal dealer could follow up his first attack, had purchased an oil burner and had it installed. There may be a lesson in this to the coal industry.

Burn Coal And Be Safe

"Well, I've shovelled my last ton of coal. No more ashes for me. I'm going to burn oil next winter; clean-inexpensive automatic—needs no attention—plenty of heat etc."

If the above expresses your thoughts, pause a moment before signing on the dotted line and paying in advance for this boon (?) to civilization. Isn't it just possible that there may be some things about oil burners which are carefully avoided by their salesmen?

Your Coal Dealer

would be the last person from whom you would seek advice on the subject, but with the information which he gathers every week from customers who have taken out their oil burners and gone back to coal, isn't he well qualified to discuss the disadvantages of burning oil as compared with coal?

If you are contemplating such a change why not hear both sides of the story before obligating yourself.

Coal Will Not Explode

Neither will it leave a black, greasy smudge throughout your home, and it does not require delicate mechanism to make it burn properly.

This Broadside Sold an Oil Burner

Combustion Noise of Domestic Oil Burners

By Alfred Ruttiman

THE objectionable roar inherent in most of the domestic oil burners of to-day for residence heating has been accepted by their manufacturers as a necessary symptom of good combustion.

Noise denotes violent turbulence of oil vapor and air in process of combustion. Minute globules of oil and oil vapors, with the chemically more or less exact proportion of oxygen equally finely divided but not thoroughly mixed, are heated quickly to the flash point and combustion temperature, expanding rapidly in the process of combustion, further mixing the products of combustion and further increasing the efficiency of the process by turbulence. Rapidly and irregularly-expanding gases mean noise, which seemed to be necessary for good combustion. Such vibrations, however, are readily and unfortunately easily conducted directly, or by resonance through pipes, wood or stone walls, upstairs to the living rooms, causing there more or less hum, rattle and even vibration of walls and furniture. This is a feature of most of the present automatic, motor-driven, domestic oil burners, and one, on which some prospects base their strongest arguments against installing them in their residences.

The ear is an extraordinary sensitive organ. One authority places the ear power, i.e., the rate of energy in form of sound, which would have to be supplied in order to be faintly audible at

$$\frac{1}{100{,}000{,}000}$$

gram centimeter second. This is a very tiny quantity, warranting a close study of the special combustion processes under consideration.

EFFORTS TO PREVENT NOISE

Many schemes of varying merit have been tried by inventors and manufacturers, especially of fan-type domestic oil burners, in an endeavor to eliminate or muffle this noise. These efforts can be classed into three major groups:

1. By improving atomization;
2. By preheating the mixture separately and releasing it at a somewhat greater velocity than the flame propagation;
3. By improving the shape and kind of material of the combustion chamber after careful determination based on repeated experiments.

While several small types of practically noiseless cook-stove burners are on the market employing an entirely different principle (silent glow) than above-mentioned for burning the oil, these systems as yet have not obtained a large distribution when attempts have been made to build them in larger sizes.

In these burners the process of combustion is slow, compared with previous types and yet quite efficient, chemically. In one of these types, the oil is evaporated by radiant and conducted heat from the combustion chamber and, as a superheated oil vapor, enters a narrow combustion space having large perforated side areas through which air flows in small and tiny streams, being preheated and slowly burning with the oil vapor under very favorable temperature conditions.

In another type, previously heated oil vapor is injected into a Bunsen-type nozzle and exits through slots or holes, burning with a beautiful, greenish-blue flame, just the same as in a gas burner.

Several other types of cook-stove burners with wicks also distinctly vaporize or gasify the oil and burn it without any appreciable noises. None of these burners has been built commercially in large sizes and yet in them apparently is hidden a secret of noiseless operation, i.e., oil vapor superheated to the proper combustion temperature, somewhat separate from the combustion space, and kept at this temperature while moving slowly through this space, receiving progressively small and uniform streams of air preferably through slotted and perforated combustion walls, burning progressively with a perfect blue flame. This seems to be the ideal condition for noiseless operation.

THREE DEFINITE CONDITIONS CAUSING NOISE

Should it not appear clear, from the previous explanatory statements, that three definite conditions or reasons for noise exist in domestic oil burners?

1. Imperfect atomization which is imperfectly distributed oil in the air for combustion, causing turbulence and noise.

2. The rapid expansion of the gases to at least six times the original volume may also result in turbulence and noise.

3. Premixture into hot tubes may cause unstable conditions and flareback, noise and flicker.

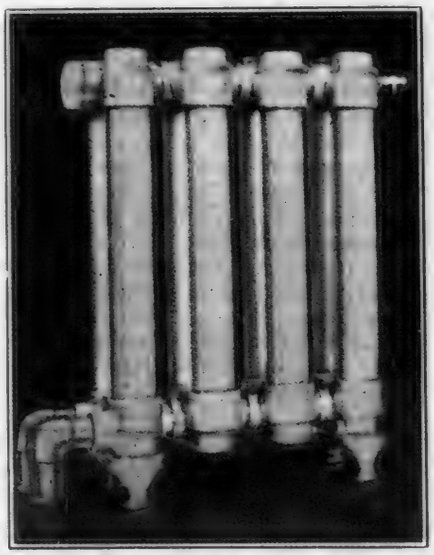
On the other hand, the gasifying process of the cook-stove burner superheating this oil vapor uniformly to combustion temperature and burning it by successive exposure to a multitude of uniformly preheated tiny streams of air, may be noiseless, yet as previously indicated, the vaporization process by wick or hot cup does not lend itself in its present form to the successful operation of large burners of this type, especially when we consider that, for residence heating, not kerosene but furnace oil and fuel-oil are used, on account of very serious price considerations in favor of the latter.

These oils, leaving a very much larger residue, when evaporated by heat from a vessel, preferably should be atomized by centrifugal disk or by air pressure as experience has clearly shown.

It would seem, therefore, that successful and yet noiseless operation of domestic oil burners could be attained by a combination of the two classes of oil-burning principles, i.e. power atomizing, centrifugal or nozzle-type and with Bunsen-type blue flame or wick-type combustion chambers.

Tubular Aluminum Radiator Embodies Unique Features

A radical departure from the conventional in radiator design and construction has been placed upon the market in Canada. It is built of aluminus tubes, each loop being composed of two concentric tubes, with a half-inch water space between them. The inside tube provides an air flue, greatly increasing the circulation of air, and the heating capacity of the radiator. A humidifier is incorporated in each radiator, which is claimed to be capable of evaporating



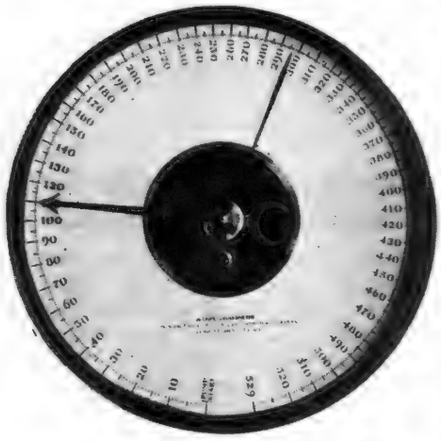
Aluminum Tubular Radiator

more water than could be done by a cast-iron radiator. The radiator has a water capacity only about one-quarter that of the convenitonal radiator, which, coupled with its ablility to radiate, means a rapid circulation of water. The tubes are joined to cast-aluminum heads by swedging, and the addition of sections is consequently easy. It is stated that 100 sq. ft. of this radiation weighs only 100 lbs., as against 700 lbs. for cast-iron radiation. These radiators are made by the Archer Radiator and Furnace Limited, Toronto, Ontario.

New Apparatus and Appliances

A Tank Level Indicator

A novel design for an automatic permanent-reading precision instrument for indicating the liquid contents of tanks, whether under pressure or not, has appeared under the trade name of the de Giers Liquidometer. It is manufactured



Dial of de Giers Liquidometer

by the Liquidometer Co., Inc., 173 Thomson Avenue, Long Island City, N. Y. It is a permanent registering gauge, easily readable.

With this instrument the indicating dial may be placed at any distance from the tank in which the instrument is installed. The dial is provided with two hands one of which is operated at will and is used to mark the standing contents of the tank. The other hand is controlled automatically by the level of the liquid in the tank, moving counterclockwise when liquid is withdrawn and clockwise when liquid is introduced into the tank. A mechanical control at the tank end of the instrument is designed to absorb all temperature changes which result in expansion or contraction.

Hydraulic means are provided to secure transmission from the point of installation to the dial. A non-freezing fluid is used for this purpose and is carried through two small copper tubes. The gauge may be applied to any tank regardless of size or character of liquid.

New Republic Instrument

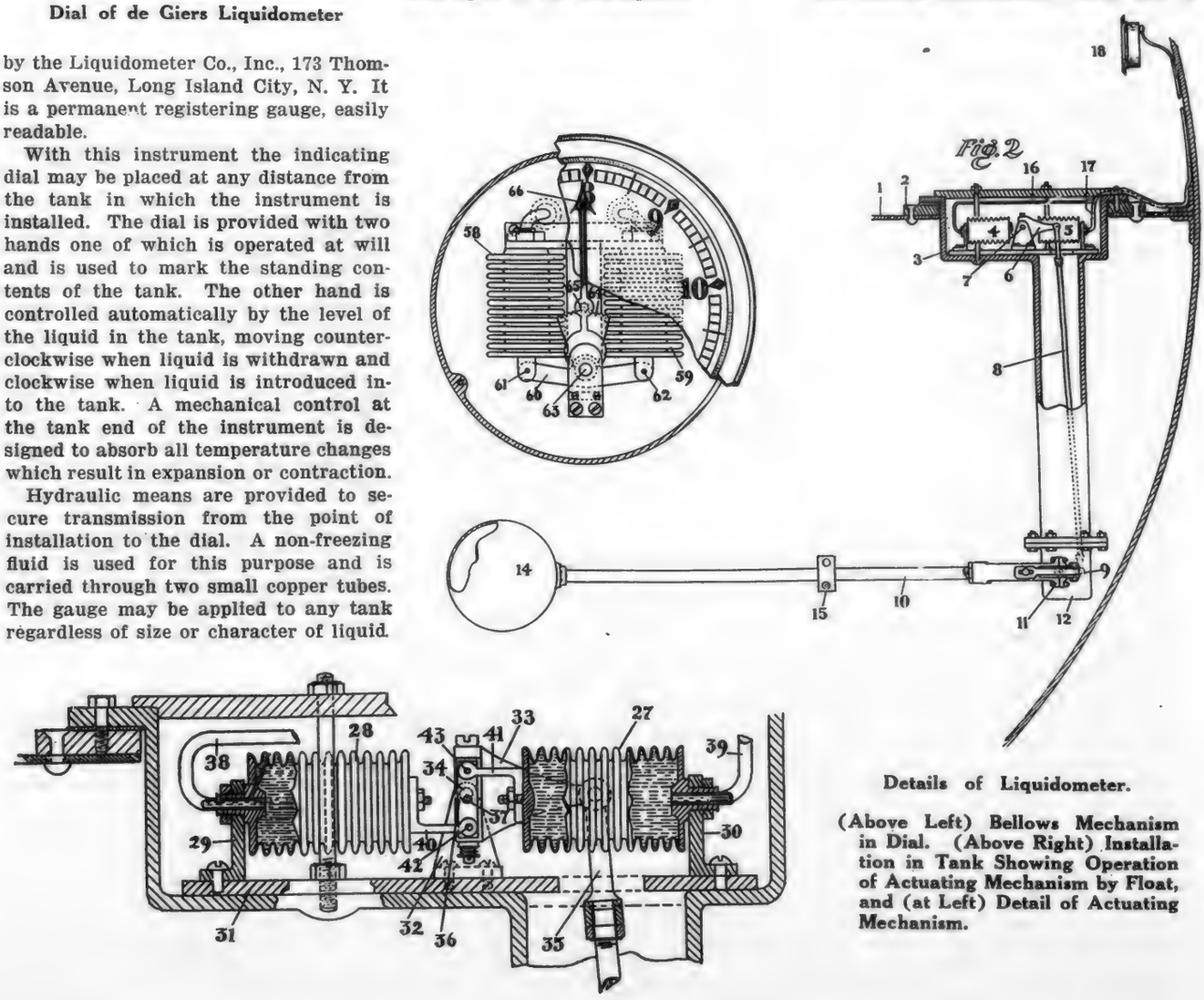
Republic Electrical Level and Pressure Indicators-Recorders, is the heading of a well illustrated circular showing the application of Republic meters in hydraulic work, oil stations, blast furnaces, water supply systems and gas works. This instrument is a new application of the principle used in Republic meters, and should have wide application.

The complete installation consists of the actuating mechanism or gage body which changes the pressure head into a corresponding current of electricity and the recording and indicating instruments which are actuated by the current. The electrical instruments are exactly the same as those which have been used with the Republic flow meter for a number of years past.

The gage body or actuating mechanism consists of a U-tube containing mercury, with one side open to the static pressure to be measured, and the other side open to the atmosphere.

Panel Board of New Republic Indicating and Recording Intruments

The pressure of the water, gas, or other fluid on the column of the mercury raises it in the atmospheric side until the weight of the mercury column balances the fluid pressure. This rise of mercury cuts out resistance in the internal resistance element and consequently alters the current flow in proportion to the head. It is then only necessary to transmit the current to the desired instruments which will in-

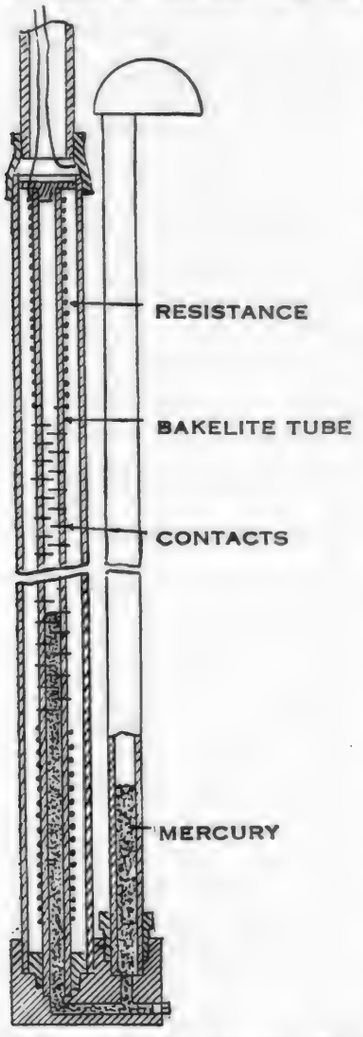


Details of Liquidometer.

(Above Left) Bellows Mechanism in Dial. (Above Right) Installation in Tank Showing Operation of Actuating Mechanism by Float, and (at Left) Detail of Actuating Mechanism.

dicate and record in accordance with the current flowing.

The resistance element consists of a tube of bakelite having contact rods extending across the bore. As the mercury rises it makes electrical contact with successive rods. Around the ends of the tube is wound the resistance, and leads



Cross-Section Republic Electrical Gauge Body

are taken from the proper points to the various contact rods.

The base piece is made of a block of steel. All parts are amply strong for any service to which they may be subjected. The consumption of current at maximum load is only that of a 40 watt lamp, about a cent a day.

The Heggie-Simplex "Bungalo Boiler"

Heggie-Simplex boilers are now available in a diminutive copy of the larger sizes, known as the "bungalo boiler." This small size is described in an interesting little folder sent out by Heggie-Simplex Boiler Co., Joliet, Ill. This is a fire-tube boiler, one section of the tubes conducting the gases to the front of the boiler from the combustion chamber, and the other returning them to the rear, and smoke outlet. The boiler is, of course, all steel, and particular attention is drawn to the ease with which installation can be accomplished, owing to the unit construction, it being only necessary to level up the channel steel base and set the boiler unit upon it. As the entire front head swings open, cleaning of the tubes is made easy. The firing door is also generous in size. These small boilers are constructed in the same way, of the same class of materials as are common to the larger units, and they are now being placed on the market with the benefit in prices accruing from quantity production. The bungalo boiler is rated at 600 sq. ft. of steam radiation, and occupies a floor space 24 x 48 in.

The Z. H. G. Heating System

From Europe comes details of a new steam-water heating system, known as the Z.H.G., which has been developed under the supervision of Professor Dr. Karl Brabbée, the well-known German heating authority who is now in this country in charge of the experimental work being conducted at the American Radiator Company's testing laboratory in Yonkers, N. Y.

The Z.H.G. is neither a device, nor a special type of construction, but, as its name implies, is a whole system, consisting of a series of parts which are indispensable and an integral part of the Z.H.G., and a second, supplementary series, which are not absolutely essential, but are highly desirable if the highest possible heating efficiency is to be obtained. The latter devices can be adapted to other types of heating plants to add to their efficiency.

One of the greatest drawbacks to steam heating is the loss of effective heat. Hot water systems overcome this to a great extent, but, on the other hand, their first cost is considerably more, and it was in many cases difficult, at least in Europe, to adapt them to existing operating conditions.

The Z.H.G. system is designed to effect a combination of the advantages of both systems, a combination steam-water heating plant. Such a system must of course have one or several points where steam heat is transformed to water heat. The device used to accomplish this is called the "Transformer" or steam-water heat unit (Dampfwasserheizglied). Its construction is shown in Fig. 1.

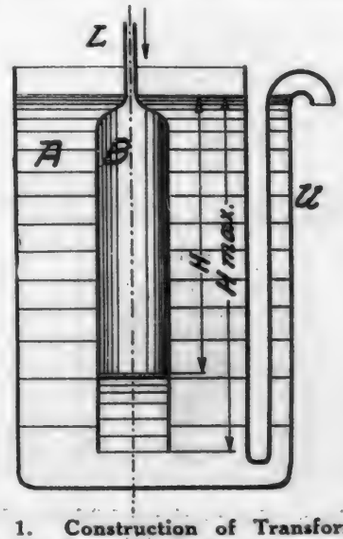


Fig. 1. Construction of Transformer or Steam-Water Heat Unit

OPERATION OF TRANSFORMER

It consists of an open water receptacle *A*, in which is inserted another also

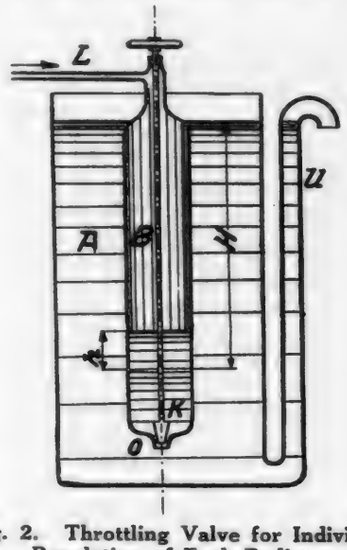


Fig. 2. Throttling Valve for Individual Regulation of Each Radiator

open receptacle *B*, with its mouth downwards. Assuming that there is no air in the system, this receptacle will at first be completely filled with water. If, however, steam is admitted through the feed pipe *L*, the water will be forced back, until the pressure is equalized. The surface of the water in *B* will be as many inches lower than the surface in *A*, as the steam pressure indicates, expressed in water column inches. This measure we may designate as *H*.

As soon as steam is admitted to *B*, we have a space which is filled with steam, and surrounded outside the receptacle by the water in *A*. As a result the heat of the steam is given off to the surrounding water in the proportion in which the wall of *B* permits its passage. If the material is a good conductor of heat this proportion will be considerable.

Further, it is evident that the amount of heat transmitted will increase with the transmission surface. This surface in our case is, of course, dependent on *H*. As *H*, again, represents the steam pressure, it follows that the smaller the steam pressure, the smaller will be the surface for heat transmission, and the smaller the amount of heat given off to the water—and vice-versa.

For every ounce of steam pressure in the space *H*, there is a definite heat transmission surface, which we will call the interior heating surface. The interior heating surface varies in accordance with the steam pressure. The greatest possible pressure is represented

by *H* max. If this is exceeded, steam would pass out under the submerged opening of *B*.

HOW TRANSFORMER PERMITS CENTRAL REGULATION

If each room that is to be heated contains one or more of these receptacle sets attached to the steam line *L*, it is evident, (if we omit for the present the loss of heat in the lines) that each set will have the same *H*. Thus, the transformer is an effective means of controlling from the central plant the heat delivered in each room, thus permitting central regulation. That, in turn, means that the fuel consumption can be made entirely dependent on the outside temperature.

REGULATION OF STEAM PRESSURE

The second problem that must be solved, if an ideal central regulation is to be obtained, is the regulation of the steam pressure. This must, of course, be capable of very fine shadings, from the maximum point permissible, *H* max., to almost *O*. Further requirements with which the regulator must comply are: Quick and easy action in obtaining the desired pressure and the ability to hold this pressure exactly. The Z.H.G. pressure regulator is designed to fulfill these requirements.

These devices are intended to solve the question of central regulation, where even temperature in all rooms is satisfactory, as, for instance, in schools, and hospitals. Where variations are required according to the wishes or physical reactions of different people, as in dwellings, where some rooms should be kept very warm and others far cooler, a method of local regulation is also essential. The transformer has been constructed to include this feature for dwellings.

If the open end of *B* is fitted with a valve, so that the opening can be closed off partially or entirely, we have the following situation: If the valve is wide open, the process takes place as above described. The steam pressure will force the water level in *B* down to *H* and the condensation will pass through the opening *O* into *A* (Fig. 2).

If we close off the opening *O* by the valve *K*, so that the condensation cannot pass sufficiently rapidly from *B* to *A*, a stoppage of the condensation will occur in *B*, and the interior water level will rise, although the steam pressure does not change. This reduces the interior heating surface until a point of equilibrium is reached in which the water level is higher by "*h*" than would correspond to the steam pressure. The more *O* is closed off, the greater will be "*h*", and the smaller the quantity of heat will be transmitted, until, when *O* is entirely closed off, the entire interior heating surface of *B* will soon become inoperative. Thus the system provides a means of decreasing the local heat supply in any room to any desired point below the central regulation, but not of increasing it.

ECONOMY FEATURES OF SYSTEM

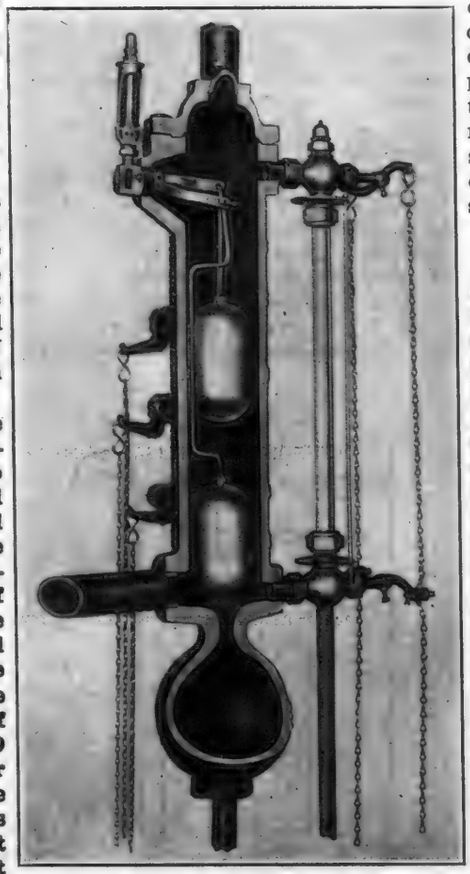
It remains to be shown that this system makes possible a real economy in heating costs. It will be seen in Fig. 1 that the steam, after having given off its heat, is condensed and mixes with the water in *A* and *B*. As it condenses it flows off through the overflow or return line *U*. This condensation water is an accurate measure of the heat which has been given off in *B* to the water in *A*. Every kilogram of water condensed corresponds exactly to one kilogram of steam used, and a corresponding quantity of heat units. It is, in fact, possible to consider the steam pressure as constant within the pressure limits in which we are operating (from 1.005 atmospheres to a maximum of 1.05 atm.), but it will be seen that even this minor variation is recorded. So it is only necessary to measure or to weigh the water flowing off to ascertain the exact amount of heat units used.

To carry out this idea in practice, all that is required is a suitable measuring apparatus, such as a water meter for the return condensed water. This meter makes it possible to put the supply of heat on exactly the same basis as electric light or gas, and to meter the tenants in heat units for their share of the heat.

The future foreseen in Europe for the Z.H.G. system is in the construction of central heating plants which can supply groups of buildings, whole streets or sections of cities, making the charges on a strictly mathematical and fair basis, and enabling the operating plants at the same time to eliminate a large factor from their cost calculations which must now be allowed for unforeseen heat losses through waste on the part of subscribers, etc.

New Trade Publications

RELIANCE STEAM SPECIALTIES is the title of a new catalog issued by The Reliance Gauge Column Co., Cleveland, O. A price schedule taking effect as of August 1, applies to this catalog, which illustrates, describes and lists data of all the Reliance specialties. An interesting section of the catalog tells of the manufacture of the one-piece floats, and the tests that are made to insure uniform characteristics. These floats are built up on a light composition form, into which a brass spud is set. The form is then covered with a special conducting coating, and a heavy deposition of copper formed by electrolytic process. This coating, it is stated, has a density greater than that of sheet copper, and it is put on to such a depth that the buoyancy of the float, and its mechanical strength, are of the desired standard. The result is a leakless float, even when purposely hammered out of shape. Size 8½ x 11 in., Pp. 16.



Reliance Water Column With One-Piece Floats

ROSS STEEL BOILERS form the subject of a catalog issued by The Frost Manufacturing Co., Chicago, Ill. The Ross steel boiler is a combination of water-tube and fire-tube. The water-tubes are located directly over the combustion chamber, and, with the water-jacket almost entirely surrounding this space, a maximum advantage is taken of the radiant heat of the fire. From the rear of the boiler, the gases pass forward through a central flue, the top of which forms the convex crown-sheet. This design also permits of a high utilization of heat from the gases, and the shape of the crown-sheet prevents the accumulation, on it, of mud, or other sediment. The floor of this central flue is of fire-brick tile, readily replaceable, and the accumulation on it of soot that might collect in the flue does not decrease or impair the heating surface. From the flue, the gases enter the front manifold and revert to the rear of the boiler through fire-tubes. The water-tubes are inclined to secure rapid circulation, and the water-arch is provided with baffles

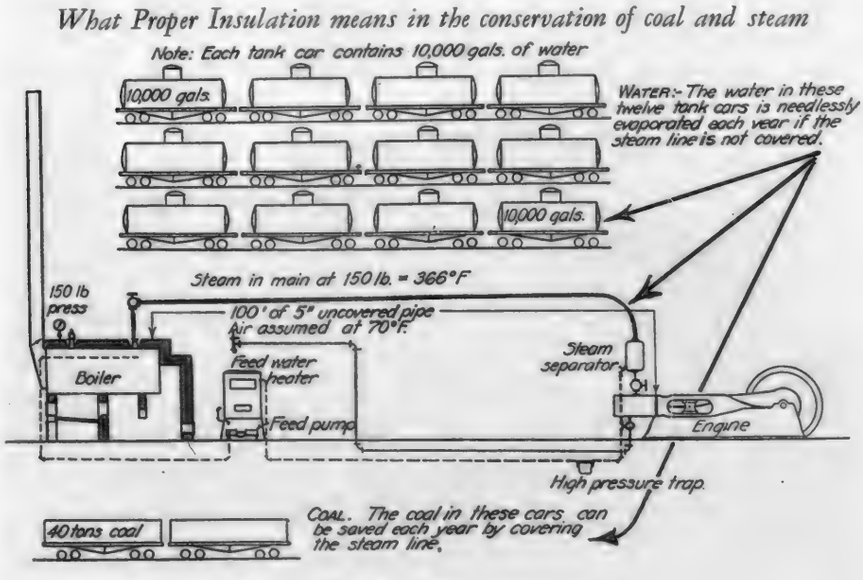
to secure the positive movement of water from the side jackets. The Ross boiler is said to be well adapted to the use of oil burners, on account of the large combustion chamber, the large exposure of water-backed surfaces to the radiant heat of the flame, and the long gas travel. Steam boilers rating from 400 sq. ft. to 27 000 sq. ft are listed, with equivalent sizes for hot water. All necessary measurements, sizes and weights are given, together with a page of illustrations of buildings in which Ross boilers have been installed. Size, 6 x 9 in., Pp. 16.

THEATRE COOLING is the caption of an interesting little book circulated by Carrier Engineering Corporation, Newark, N. J. A great deal of useful information concerning theatre cooling and ventilating is interspersed with statements of theatre owners and managers as to the financial benefits accruing from the use of Carrier systems in play-houses. The booklet carries a convincing message as to the worth of "manufactured weather," and concludes with a list of prominent industries served with Carrier installations. Size 6 x 9 in., Pp. 28.

KNOWLES MUSHROOM FRESH AIR DIFFUSERS, forms the subject of a new publication of Knowles Mushroom Ventilator Co., 202 Franklin St., New York. This 8-page circular describes and gives technical data for the various types and sizes of ventilators and specification for the roughing-in. There is also appended a considerable list of theatres, public buildings, schools and churches in which these ventilators have been installed.

Visualizing the Value of Insulation

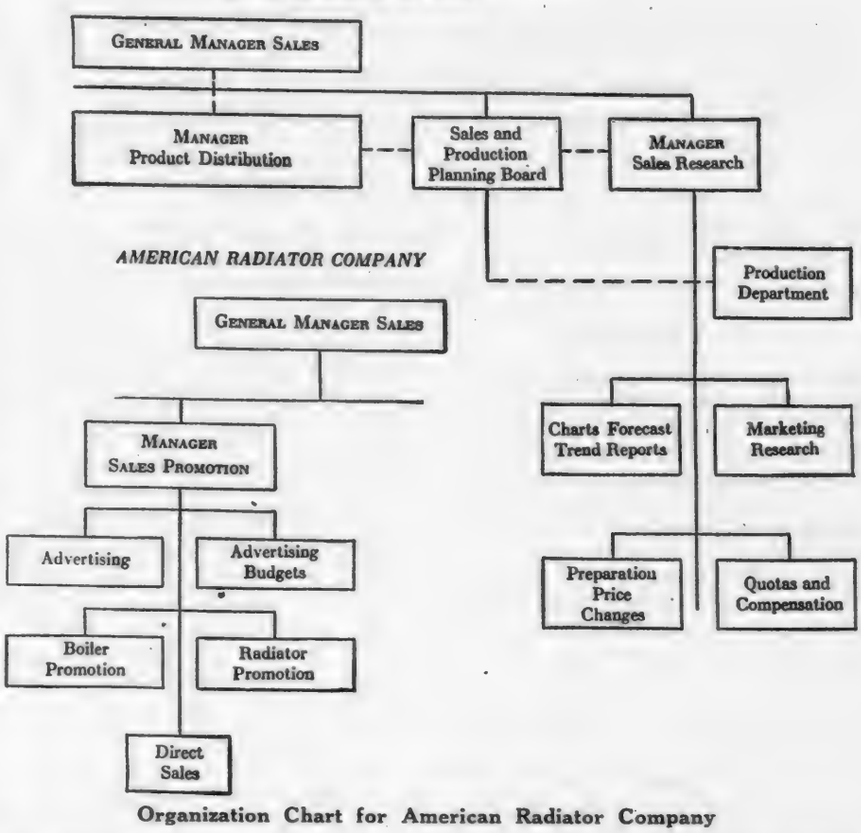
A cleverly conceived drawing showing graphically the effect of proper insulation of steam mains is reproduced from the University of Illinois Engineering Experiment Station's bulletin No. 7. It seems hardly possible that 12-tank cars of water would be the annual condensation from 100 ft. of 5-in. uncovered steam pipe line carrying steam at 150-lb. pressure, or that 2 carloads of coal aggregating 80 tons could be saved by proper insulation of this pipe. The drawing tells its own story.


What Proper Insulation means in the conservation of coal and steam
Note: Each tank car contains 10,000 gals. of water
10,000 gals.
WATER:- The water in these twelve tank cars is needlessly evaporated each year if the steam line is not covered.
10,000 gals.
Steam in main at 150 lb. = 366°F
150 lb press
100' of 5" uncovered pipe Air assumed at 70°F.
Boiler
Feed water heater
Feed pump
Steam separator
Engine
High pressure trap
40 tons coal
COAL. The coal in these cars can be saved each year by covering the steam line.

Economy Follows Steam Pipe Insulation

AMERICAN RADIATOR COMPANY

It is to be noted in the case of the American Radiator Company that the sales research department acts as a coordinating body for production and distribution of the product.



Organization Chart for American Radiator Company

TENDENCIES IN SALES ORGANIZATIONS, being No. 3 of the "Management Methods" series of booklets issued by the Metropolitan Life Insurance Company, New York, contains an interesting chart showing the sales organizations of such firms as the Elliott-Fisher Company, Burroughs Adding Machine Company, American Radiator Company, A. Elliott Fisher Company and the C. Fuller Brush Company. Perhaps the most striking development to be noted in this connection is the increased importance being given to the staff functions of sales promotion, sales research and statistics, and sales training.

In an item in our September issue under "New Trade Publications" a review was presented of the new catalog of the Veco system of vapor heating, recently placed on the market by the Vapor Engineering Company. The address of the company was given as 489 Fifth Avenue, New York. It should be stated that this catalog was issued jointly by the Vapor Engineering Company of New York and the Vapor Engineering Company of Philadelphia, the latter company being located at 10 South 18th Street, Philadelphia. Outside of the fact that each company handles the Veco specialties in separate territories, they have no direct connection.

Present Accepted Practice in Domestic Oil Burners

8. **CHALMERS. Atomizing, Pump or Gravity Fuel Feed to Float Chamber—Gravity to Nozzle.**
9. **HART. Atomizing, Pump Fuel Feed, Air-Blast.**
10. **SUN. Vaporizing, Gravity Fuel Feed, Atmospheric or Air-Blast.**

Previous articles in this series are: July, 1925,—1. *Kleen Heet*, 2. *Baker*, 3. *Kerrihard; August*, 1925,—4. *Silent Glow*, 5. *Aetna; September*, 1925,—6. *Caloroil*. 7. *Oil-O-Matic*.

8. Chalmers

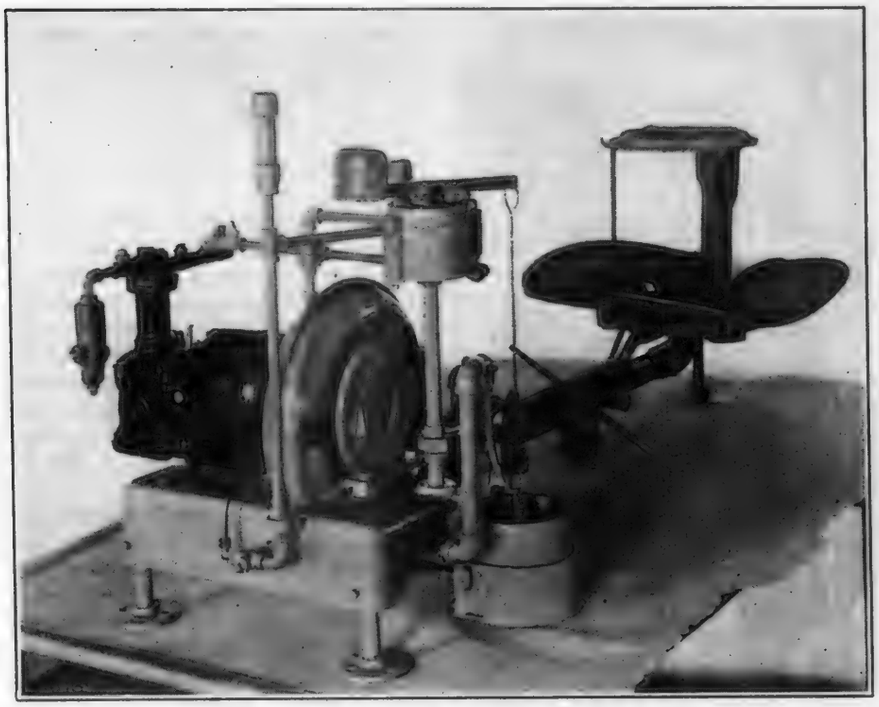
IN the entire oil-burning field there are several burners that are outstanding because of the fact that they are original in construction and design, and are not copies of other burners. Pre-eminent in this class is the burner built by the Chalmers Oil Burner Co., of Minneapolis, Minn. This burner is unique in many of its characteristics, from the method of supplying fuel to the burner, to the type of flame and its utilization. The burner head is, roughly, a circular plate with three angular wings, that is set on the floor of the ash-box. In the center of this plate is located the nozzle which consists of a stationary fuel nozzle or orifice inside of an air nozzle, so designed that the air blast picks up the oil from the oil nozzle. The flame is thus a jet type, and is projected vertically from a very low position in the boiler. Above, the burner head, and supported on three legs, is a horizontal plate of iron, on the under side of which is fastened a disc of refractory material. The function of this plate is two-fold. It acts as a flame spreader, throwing the flame out horizontally at the very bottom of the water-jacketed section of the boiler. In the second place the radiant heat reflected from this disc is a material aid to the gasifying of the oil gas, projected upward from the nozzle. The result is a very complete combustion and a flame that may be utilized with a high degree of efficiency.

It is interesting to note that a comprehensive series of tests has been carried out on this burner at the University of Minnesota, and these show average CO_2 in the flue gas to be 12.78, and as high CO_2 contents as 13.4 has been obtained. When this burner is installed, the setting is so made that it is impossible for any incandescent flame to impinge on the waterbacked surfaces of the boiler, and it is therefore impossible for carbon to form on the inside of the boiler. For this reason, also, it is not necessary to brick up the combustion chamber or any part of it, and this again means that the heat transfer at the bottom of the boiler will be a maximum.

A very clever method of furnishing oil to the nozzle has been developed. Oil may be supplied either from a service tank in the basement, or from a main tank located under the basement floor, or underground outside. In either case oil comes through a filter and into a chamber where its level is regulated through the medium of a float valve. Air from the fan blast is piped to the upper part of this chamber. In the top of the chamber is an opening, which is normally held closed by a safety lever. This vent is opened to the atmosphere by the release or the safety bucket, in case of overflow from the burner, or from the float chamber itself. From the float chamber, the oil is led to a vertical stand-pipe, near the bottom of which is a plug with a hole in its center. Extending down through the stand-pipe, and through this hole is a rod threaded on its upper end, and with a tapering channel extending axially from its lower end, a distance of about 2 in. This channel has a tapered section, having its greatest area at the end and running out to nothing in a distance of about 2 in. It is obvious that with this rod passing through the hole, which it fits snugly, the amount of oil that will flow through this groove will be regulated by the vertical location of the rod in regard to the hole, and this is accomplished through threading the upper part of the rod and adjusting it by means of a nut and a lock-nut.

The burner is, of course, thermostatically controlled. The rest of the burner unit consists essentially of a motor-driven fan. When the burner starts, the air blast from the fan passes through the connecting pipe to the burner head, and also through a second pipe into the upper part of the oil chamber. This air pressure on the oil contained in the oil chamber causes the oil to flow into the vertical stand-pipe, near its upper end, and the air pressure is so adjusted as to cause the oil to rise to a definite

Installation of Chalmers Oil Burner



Chalmers Oil Burner, Model 3-A

head in this stand-pipe. Under this head the oil then flows through the controlling slot in the bottom valve, and from there directly to the nozzle, where it is atomized by the air blast from the fan.

It is obvious that if the fan motor stops, the air-pressure is removed from the upper part of the float chamber, and the oil fails to rise to the stand-pipe; consequently none is fed to the burner, nor can any oil get to the burner through this path. An overflow from the oil float chamber to the safety bucket is provided in addition to the overflow from the burner. In the case of any accidental over-supply of oil to the float chamber the overflow will trip the safety bucket, and release the safety lever, which will relieve the air pressure from the top of the oil chamber. In case of failure of the burner to ignite, the over-flow from the burner head will accomplish the same purpose. Ignition is provided for by a gas jet that is protected against blowing out, and requires only a small amount of gas. It is thus seen that the burner has only one moving element, the motor armature and its attached fan. To install a burner no permanent changes are necessary, the ash-pit door and grate being removed. Only one size of burner is made and it is stated to be able to handle any domestic boiler from 20-in. to 48-in. diameter fire-pot. Either Minneapolis or Honeywell control is supplied. The burner is designed to operate on practically any of the common domestic fuels, but 32 gravity A.P.I. oil is recommended.

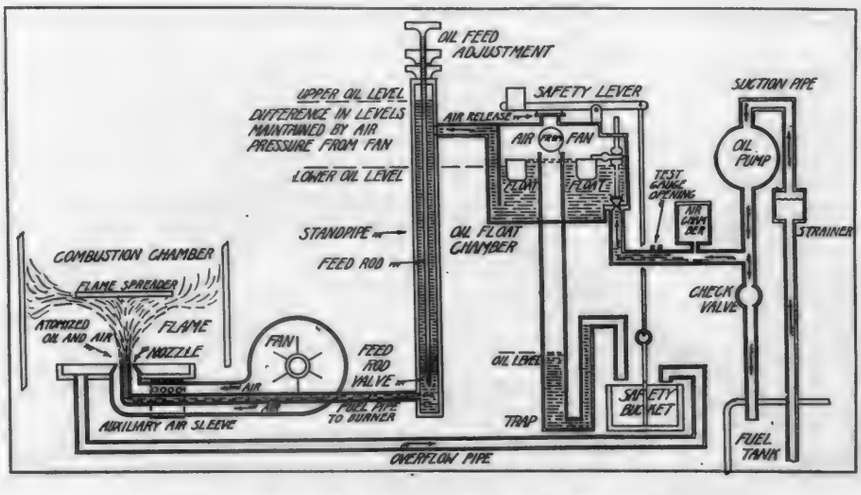
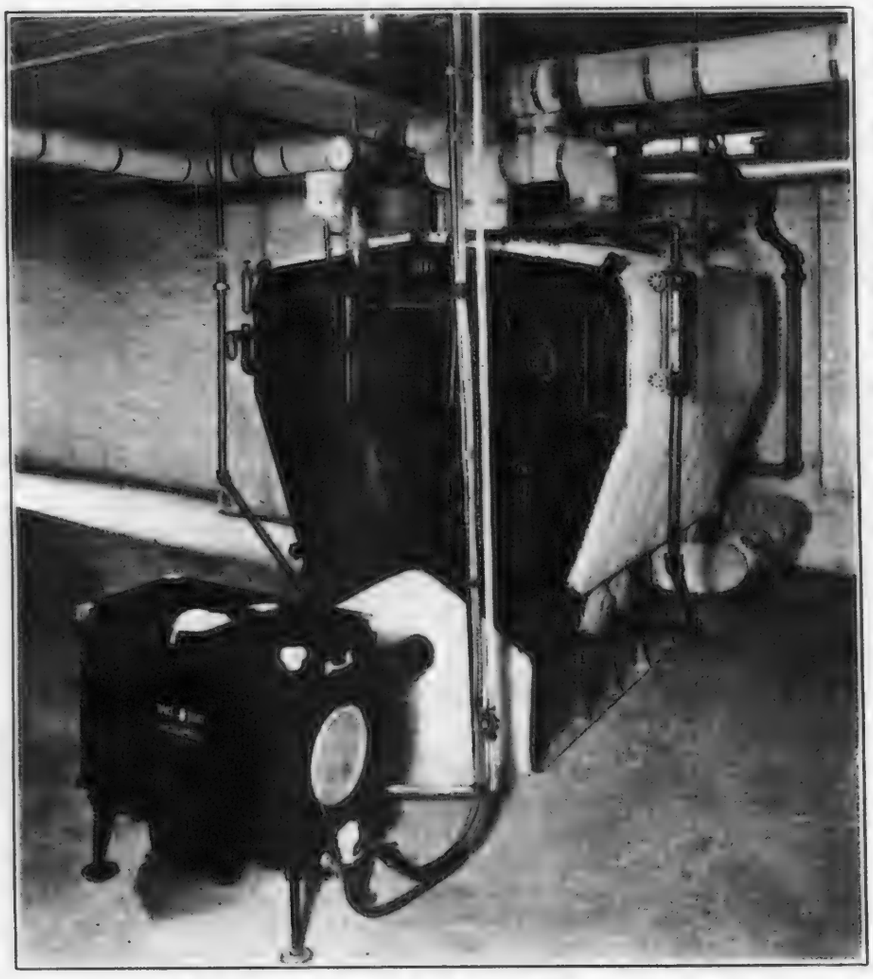


Diagram of Oil Supply, Feed and Control, With Air Supply of Chalmers Oil Burner

9. – Hart.

The use of a Venturi tube located on the burner unit and outside of the blast-tube, with a carefully worked out method providing against the admission of any unatomized oil into the furnace, characterizes the Hart burner, manufactured by W. B. Wilde Co., Peoria, Ill.

This burner consists essentially of a unit base, mounted outside of the furnace, and upon four legs, with provision for levelling. This iron base carries all of the mechanism incorporated in the burner, and is connected to the furnace with a steel blast tube. In distinction to burners using a Venturi tube located in the blast pipe, the Venturi in the Hart burner is located outside of the blast pipe, and the atomized oil is carried through the blast tube in a comparatively small pipe, to a fuel nozzle located at the combustion chamber end of the blast pipe. Air is provided by a Sirocco-type fan, driven by a one third H.P. motor at 1725 R.P.M. The motor drives the fan through a flexible connection, and from the other end its shaft drives an air pump, also through a flexible coupling. The air pump is a centrifugal-type, provided with an oil seal, the rotor being a brass casting, with 16 blades between its two walls. These blades are curved in the direction of rotation, and the outside edges are flush with the walls of the rotor. The function of the air pump is to supply air under pressure for atomizing the oil. The pressure is normally about 8 lbs. Oil is taken to the burner by a rotary oil pump, with a capacity of about 120 gal. per hour. The excess oil is returned to the fuel tank, through a by-pass. An automatic oil valve is mounted directly over the point where the incoming oil enters the compressor. This valve opens when the motor attains full speed, and closes when the motor stops. When this valve is open, the oil flows through a small tube to the feed valve, which is mounted on the venturi in the air line from the air pump. The oil entering at this point is met by the air, at high velocity, and the major portion of the oil is atomized, and blown to the burner nozzle which is connected to the venturi by a heavy copper tube. Between the venturi and the burner nozzle is a liquid trap, which traps any unatomized oil, so that no raw fuel may be thrown into the furnace. This fuel after being trapped out of the line, is forced by air pressure back to the air pump where it serves as an oil seal. This arrangement allows only atomized oil to pass through the burner nozzle. When the oil valve is closed, no oil can get into any part of the machine except the oil pump. The valve is held closed by both



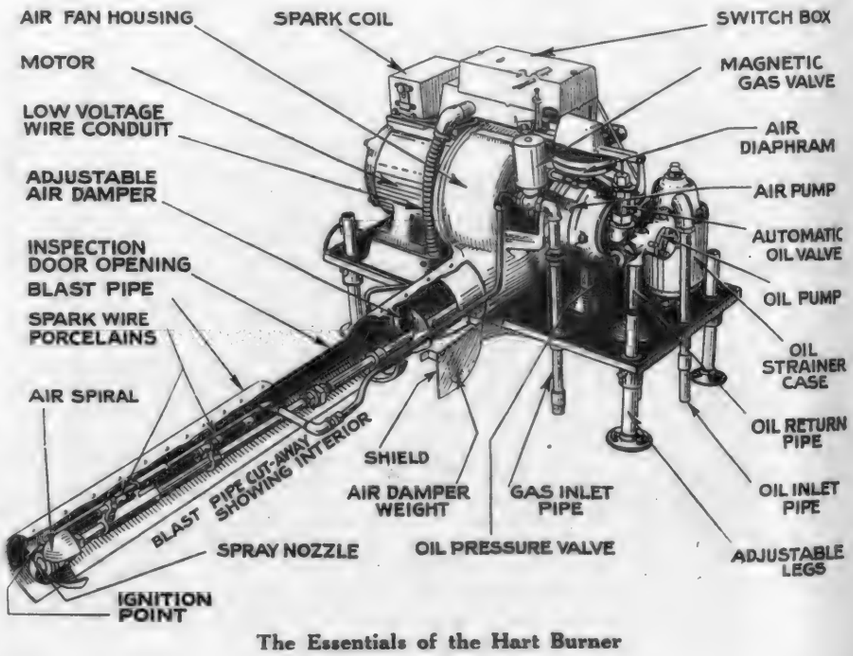
A Modern Oil Burner Installation—The Hart Burner

spring tension and a weighted lever either of which is sufficient to hold it shut. It is opened by pressure on a diaphragm which is inflated with air from the air pump, when the machine is in operation. An oil regulating valve is mounted on the Venturi, and this together with the air damper, provide a means of adjusting the burner for any particular conditions under which it may be installed. The liquid trap return valve is held open by spring tension, and is held closed by a diaphragm valve, inflated with sufficient air to overcome the spring tension. The air pressure is supplied by the air pump, consequently the diaphragm is deflated as soon as the burner stops. The stopping of the burner opens this valve, which drains the oil from the trap to a sufficient level to prevent "puffing" when the burner starts. The oil is drained into a sump underneath the burner base, where it is picked up through a hole in the air inlet pipe, and returned to the air pump.

The air blast pipe is constructed of sheet steel, and is provided with an air damper. This damper is supported on two pins, turning freely in bearings in the blast pipe walls, but secured to the damper by set screws. The line of support is so located, below the mid-line of the damper, that the upper end always tips away from the air blast. One of the supporting pins is L shaped, and carries along its external arm a weight, adjustable in position. The air blast works against the force exerted by this weight, and it is therefore possible to so adjust the weight as to control the amount of air fed to the fire. The pipe carrying atomized oil is carried through the blast pipe, as is the gas pipe to the pilot, and the electric cable for ignition.

The burner nozzle is located in the combustion end of the blast pipe, and flush with the end of it. The burner nozzle assembly consists of the nozzle with a small brass oil spiral, held against the inside of the front of the nozzle, a large brass air spiral, surrounding the nozzle, a brass ring, and two ignition wires, one of which is insulated by a porcelain bushing, and the other grounded to the larger brass spiral. The burner nozzle assembly is connected to the liquid trap by a 1/4 in. brass pipe. The mixed oil and air are forced through this pipe, and whirled in a counter-clockwise direction by the small spiral, and leave the end of the nozzle in the form of a hollow cone. The air from the fan is blown through the blast pipe, and is whirled by the outer brass spiral in a clockwise direction. The air and oil-mist being whirled in opposite directions are thoroughly mixed for combustion.

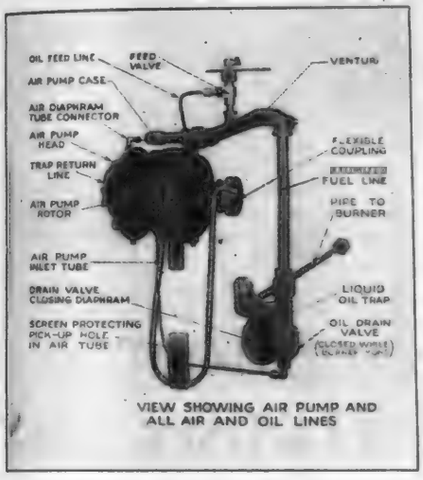
Ignition is provided by carrying gas through the fuel nozzle ahead of the initial oil-mist, and igniting it by an electric spark produced by a spark coil. A gas solenoid valve keeps the gas from the system except when starting, during which time it is lifted from its seat, allowing gas to flow to the air pump, from which point it passes through the piping to the nozzle. When the burner is started, current flows to the ignition coil, through the stack thermostatic



The Essentials of the Hart Burner

control, which is connected to a safety cut-out. The stack thermostat cuts off the ignition circuit when the stack temperature rises 40 degrees, but if, through failure of the oil to ignite, the burner has not developed this temperature in 1½ minutes, the current flowing through the safety cut-out causes the safety to trip.

Provision is made for operation where gas is not available, by providing a transformer instead of a coil, and arranging the secondary terminals to meet in front of the nozzle and then separate, through the action of a metal diaphragm, causing a spark of sufficient intensity to ignite the atomized oil without the preliminary gas flame.



Air Pump and Air and Oil Lines, Hart Burner

The burner is, of course, under the primary control of a room thermostat, and pressure or aquastat, for boiler protection.

The entire burner unit is covered with a tight fitting metal casing, preventing fumes from escaping and insuring the burner mechanism against dust and injury.

The Hart burner is "listed" by the Underwriters for oils between 30 and 32, A.P.I.

It is, of course, necessary to brick up the combustion chamber in order that the necessary temperature may be maintained.

10.—Sun.

The Sun oil burner is one of the many atmospheric types produced in the near-west, and its popularity is evidenced by the statement that there are over 15,000 of these burners in use. The Sun burner is manufactured by The Heat Equipment Corporation, Lincoln, Nebraska.

The burner was first marketed in 1920, and naturally, has a large distribution through territory adjacent to the factory, although there are now representatives in thirty-five states.

The Sun burner is made in several sizes and types, both atmospheric and air blast, the latter being also a vaporizing type, but capable of operating, with reduced capacity, on atmospheric draft in case of failure of electric supply.

The burner head, installed on the grate, is of the mushroom type, the oil being fed, by gravity, directly from a service tank up through the hollow stem. The vaporizing plate is covered with a protecting cap, the edges of which extend beyond the circumference of the vaporizing plate, the intent being to provide a more thorough gasification of the fuel.

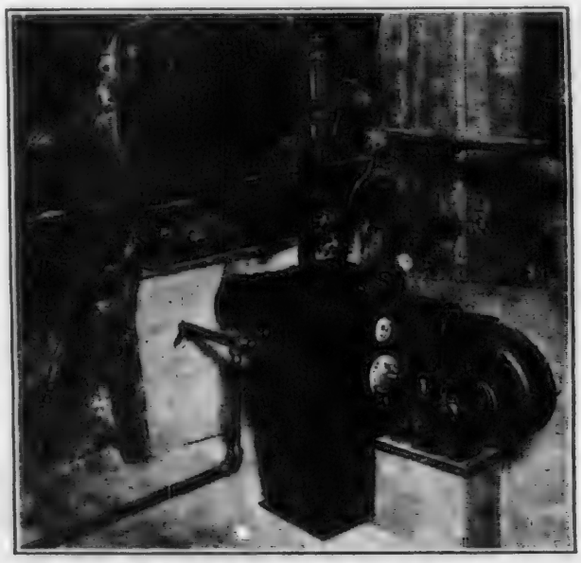
Section of Sun Burner

In the power type, the burner head is inclosed in a fire-pot, and the air blast is taken into the pot tangentially, producing a swirling flame, and, it is claimed, nearly perfect combustion. This Model "C" burner is controlled by a Minneapolis regulator, working on a regulating valve and safety shut-off that is "listed" as standard by the Underwriters.

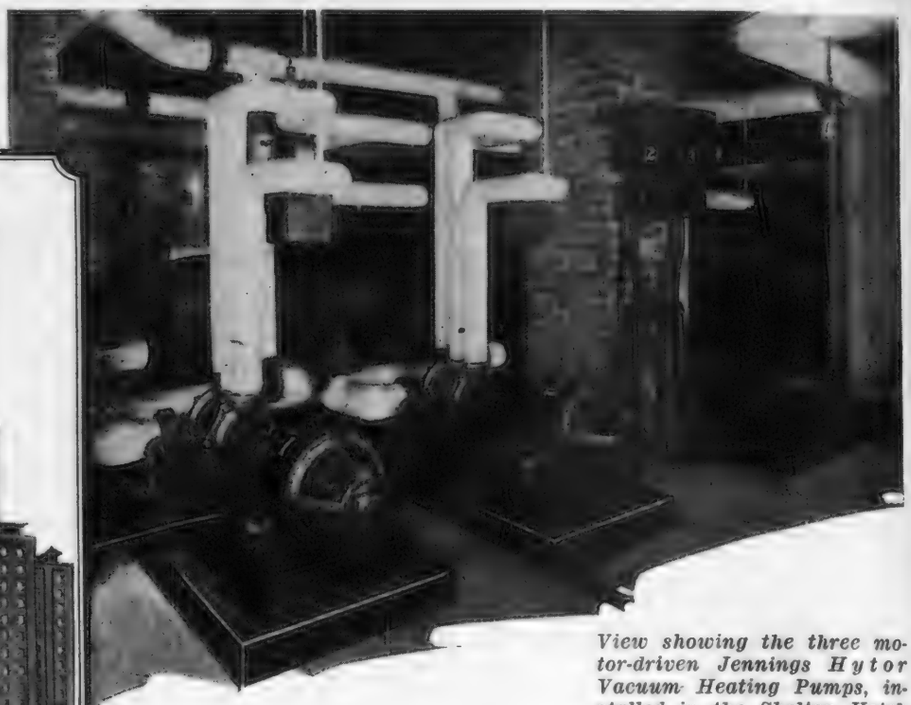
The atmospheric burners are rated with capacities up to 1,000 square feet of steam radiation, and the power type is rated up to 3,000 square feet.

Erratum—In the caption of the decription of the Caloroil burner, in the September issue, the use of the single term "gravity feed" might be construed to apply to the air supply, instead of the fuel supply. A more comprehensive designation of the fuel supply of the Caloroil burner would be: "From supply to float chamber by gravity, and from float chamber to burner nozzle by suction."

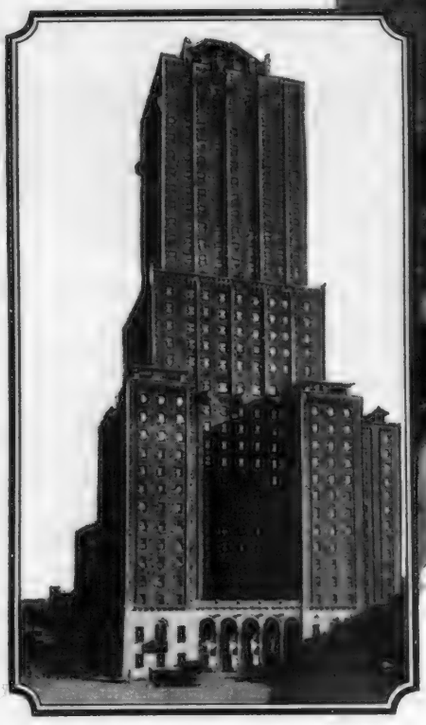
Installation of Sun Atmospheric Vaporizing Burner



Installation of Sun Mechanical Draft Vaporizing Burner



View showing the three motor-driven Jennings Hytor Vacuum Heating Pumps, installed in the Shelton Hotel, New York, N. Y.



Shelton Hotel, Lexington Ave. and 49th St., New York, N. Y. Mr. Arthur Loomis Harmon, Architect; Gillis & Geoghegan, Engineers; Shelton Holding Corporation, Owners; Mr. William Hanley, Chief Engineer.

Another engineer insists on Hytors

Chief Engineer William Hanley knows Jennings Hytor Heating Pumps. From his seven years' experience in operating Hytors, he is intimately acquainted with the unfailing service Hytors always give.

According to Mr. Hanley, Jennings Pumps never fail to make good. He has never had to repair or replace a Hytor—naturally he insisted on Hytors for the new Shelton Hotel.

This recommendation, from an engineer of wide experience, deserves serious consideration. Yet this expression of Hytor dependability is not exceptional—it correctly describes the service which innumerable other Hytors are giving everywhere.

Nash Engineering Company

So. Norwalk Connecticut

Branch Sales Offices: Atlanta, Boston, Buffalo, Chicago, Cleveland, Dallas, Denver, Detroit, Houston, Indianapolis, Kansas City, Los Angeles, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Richmond, St. Louis, Salt Lake City, San Francisco, Seattle, Washington. **In Canada:** Montreal, Toronto and Vancouver. **European Offices:** London, Eng., Norman Engineering Co.; Brussels, Belgium, and Amsterdam, Holland, Louis Reijners & Co.; Oslo, Norway, and Stockholm, Sweden, Lorentzen & Wettre.

Jennings Hytor

RETURN LINE AND AIR LINE VACUUM PUMPS CONDENSATION AND CIRCULATING PUMPS

Trade and Miscellaneous Notes

All Construction Records Broken in August

The high peak of building construction was reached in August, according to the report of F. W. Dodge Corporation. New construction work started in the 36 eastern states (which include about ⅞ of the total construction volume of the country) amounted to $589,690,200. The previous high record was in March, 1925, with a total of $546,970,700. The August increase over July was 11%, and over August a year ago, 66%. Construction started in the 36 eastern states during the past eight months has reached a total of nearly $4,000,000,000, an increase of 25% over the first eight months of 1924, and by far the largest amount for any similar period of any year. A tremendous activity in and around New York City was largely responsible for the August figures. Of these record figures 45% of all construction was for residential buildings, 18% for commercial buildings, 6% for educational buildings, 6% for social and recreation projects and 4% for industrial buildings. Based on records of contemplated new work, even higher figures may be reached in the future. All previous building records were broken last month in New York State, and northern New Jersey in which area the construction contract total was over $200,000,000, or nearly half of the total amount of construction in the United States.

A. B. C. Oil Burner Dealers in Connecticut Hold Convention

Fifty dealers who agree that the A. B. C. burner is "the best in the world" gathered in Hartford Conn., on September 12, and devoted a day to matters of mutual interest. L. S. Griffing, of the Fuel Oil Heating Company, Hartford, New England distributor of the A. B. C. burner, acted as chairman of the meeting.

A. M. Daniels, consulting heating and ventilating engineer, of Washington, D. C., presented some interesting data on practical tests he had made on the A. B. C. burner, and outlined his system of correspondence instruction in warm air, hot water and steam heating plants.

J. R. Primrose, sales manager of the General Oil Heating Company, discussed salesmanship and sales methods, and, as he is a veteran in the oil burning field, his remarks were well founded.

Stanley Perry, service manager of the Automatic Burner Corporation, told the dealers how to properly install burners, and how they functioned, and conducted a questionnaire on these topics.

This was the first of a series of district conventions that will be held under the auspices of the various sectional distributors of the Automatic Burner Corporation.

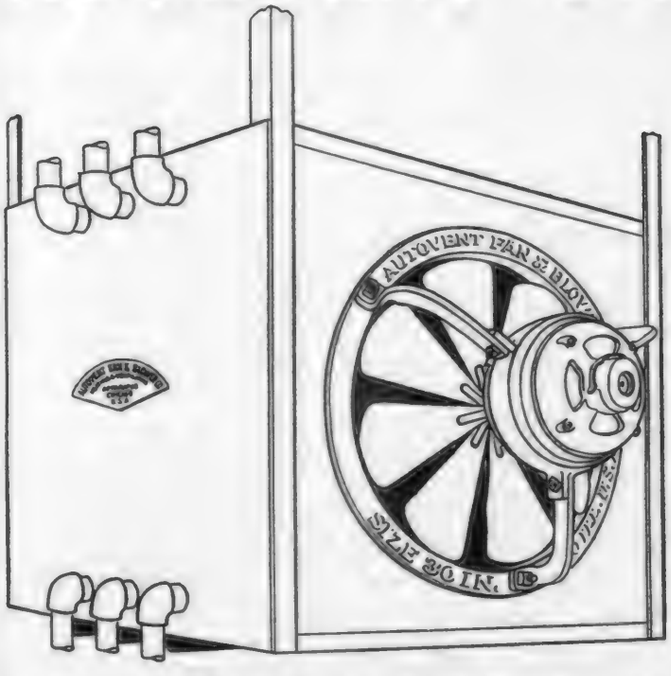
Chicago Heating Men Enjoy Picnic

Serious business matters in the heating trades in Chicago were put on the shelf during the second week-end of September, when the members of the Chicago Master Steam Fitters' Association, with their friends in the supply trade, gathered at Channel Lake, Illinois, for their big annual gathering.

A continuously assaulted cauldron of clam chowder with necessary adjuncts, attracted the attention of those usually too busy to eat, while the athletic individuals turned to such sports as are common to such gatherings. On Satur-

AUTOVENT UNIT HEATERS

CEILING TYPE



In addition to standard floor or pedestal types of heaters the Autovent Unit Heater shown to the left can in many instances be used to good advantage especially where floor space is not available.

Note the efficient Autovent fan used to induct the air into the unit at low velocity, expelling it at high velocity.

The motor on all types extends out of the cabinet. It is not in the path of the heated air, giving accessibility to both fan and motor.

Send for Engineering Data Book

AUTOVENT FAN & BLOWER COMPANY

730-738 W. Monroe Street CHICAGO

day, a baseball game between picked members of the association and an evidently unpicked nine selected from the supply men resulted in the defeat of the latter by the score of 27 to 6. It is understood that the game was called prior to the ninth inning, thwarting the claim of the steam fitters that they would score a hundred runs.

New Incorporations

Freund Plumbing and Heating Co., New York, incorporated to conduct a heating and plumbing business. Capital, $125,000.

Davenport Automatic Oil Burner Co., Portland, Ore., incorporated to manufacture oil burners. Incorporators, Thos. L. Davenport, C. R. Hallberg and J. E. Stevenson. Capital, $25,000.

Ballard Super Oil Burner Co., of Rhode Island, Providence, R. I., incorporated to sell oil burners. H. C. Kresge, Summit, R. I., Louis W. Dunn, and Margaret A. Ryan, incorporators.

Anthony B. Cassedy, Inc., Cambridge, Mass., incorporated by Anthony B. Cassedy, president and treasurer and Edward A. Counihan, Jr., to deal in heating equipment. Capital, $50,000.

Radiator Cabinet Corporation, 6028 S. State St., Chicago, incorporated with capital of $10,000, to manufacture radiator cabinets. Herbert E. Wills, James A. Royer and Christopher C. Weaver, incorporators.

H. Romeyn Smith, Inc., 64 Cliff St., New York, has been reorganized, and the capital stock increased from $50,000 to $100,000. H. Romeyn Smith continues as president, S. W. Smith becomes treasurer, and John H. Taylor secretary and general manager.

As we go to press, word has been received of the death of President H. Romeyn Smith.

Manufacturers' Notes

Barnes & Jones, manufacturers of the Barnes & Jones vapor and vacuum heating systems, announces the removal of their New York office to 300 Madison Avenue, New York, where they will be represented by Henry B. Eells. The company's appliances, which are all of their own design and manufacture, include modulation valves, thermostatic return and drip valves, the Barnes & Jones condensator for returning the water of condensation to the boiler under varying pressure conditions, the Barnes & Jones blast traps, vent traps, strainers and regulators.

Since the company's organization in 1921 it has been successful in securing a large volume of business, its devices being chosen for some notable buildings built during that period. Mr. Barnes, of this firm, was one of the organizers in 1902 of the former Thermograde Company, and was for several years its president and treasurer. Mr. Jones was connected with the Thermograde Company in the engineering and sales department from 1912. During the latter part of this time he was the company's New England sales representative.

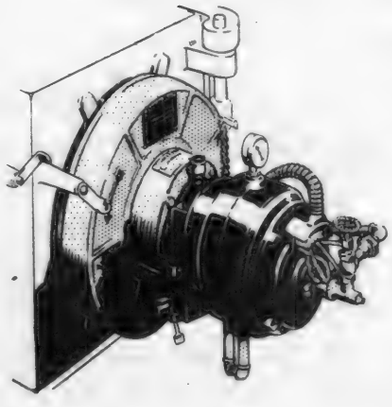
Illinois Engineering Co., Chicago, has opened an office at 141 East 4th Street, Cincinnati, in charge of F. E. Hutchen. The new manager is well known in the heating and ventilating field in Cincinnati, as he has, for years, been manager of the heating department of Van Camp Hardware and Iron Company.

Marine-Galligan Co., Philadelphia, manufacturers of heating specialties, announces that M. T. Britton formerly with the American Radiator Company, is now sales manager for the Philadelphia territory.

Dwyer Equipment Co., Chicago, has appointed R. S. Whittington as representative in the Cleveland district, with offices at 5005 Euclid Ave., Cleveland.

Gorton & Lidgerwood Co., New York, announces that the Ideal Supply Co., Greensboro, N. C., has taken the sales agency for the state of North Carolina, and portions of South Carolina and Virginia.

53 Years Experience Behind RAY OIL BURNERS



Manufacturers of the Ray Oil Burning Range, famous the world over, and of oil burning equipment for all heating purposes, domestic and industrial.

You can install a Ray Burner in a four room bungalow or a forty story skyscraper with perfect confidence that you are not making an experimental laboratory of the basement.

For fifty years the W. S. Ray Manufacturing Company has specialized exclusively in heating apparatus and for twelve years Ray Oil Burners have been delivering reliable and economical service. More than 30,000 installations today testify to the efficiency of the Ray Burner.

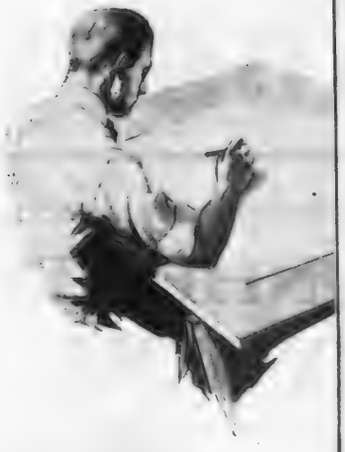
One secret of Ray performance is the Ray Rotary Vane Nozzle —one of the 28 patents found exclusively in Ray Burners. Immediate, complete and quiet combustion *at the front of the firebox* is the result of this device. Fuel supply, air and drafts are automatically controlled and complete consumption of economical low grade oils is effected. The Ray Burner is listed as Standard by the Underwriters Laboratories.

Dealers: Write for information

W. S. Ray Manufacturing Co.

721 Cass Street
CHICAGO

122 New Montgomery Street
SAN FRANCISCO



A responsibility that starts with the planning — and never ends

IF users of the Johns-Manville Underground System of Insulation thought of it only as so many feet of piping insulated by a certain method, there wouldn't be nearly as many miles of the System in service as there are today. A Johns-Manville insulation is more than a sale of material, it is the promise of satisfactory service continued through future years. This promise is backed by the responsibility of a nationally known organization which has been successful in insulation work for over fifty years—and which expects to be in business for a long time to come.

JOHNS-MANVILLE Inc., 292 Madison Avenue at 41st Street, New York City.
Branches in 63 Large Cities. For CANADA: CANADIAN JOHNS-MANVILLE Co., Ltd., Toronto.

Through Asbestos and its allied products
INSULATION
BRAKE LININGS
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CEMENTS
FIRE PREVENTION PRODUCTS

JOHNS-MANVILLE

Underground System of Insulation

Pennsylvania Leads Advance in Solving Apprenticeship Problem

PENNSYLVANIA has taken the lead in tackling the apprenticeship problem through a State-wide Conference on Apprenticeship and Apprentice Education, held August 4-5, at State College, Pa. The conference, which was attended by heating contractors, master plumbers, representatives of educational institutions and of the State Federation of Labor, was called by the Department of Industrial Education of the Pennsylvania State College, acting in the capacity of an interested, yet neutral, organization. At the suggestion of the chairman, Professor W. P. Loomis, head of the Department of Industrial Education, the conference adopted the keynote of "Co-operation and Progress."

Some 21 principles were adopted during the course of the conference, it being agreed among other things, that more technical education is needed, that care should be taken in carrying out any apprenticeship program to see that there is not an over-supply of apprentices, that the supply of apprentices in a local district should be regulated by a committee or commission of journeymen or masters, and that apprentice education should be regulated by a committee or commission of school people, journeymen and masters.

With the purpose of formulating a definite apprenticeship program for the entire State, it was voted that a State Joint Apprenticeship Committee be appointed for the heating and plumbing industries of the State by the State Superintendent of Public Instruction, to be made up of a master plumber, a heating contractor, a journeyman plumber, a journeyman steamfitter and two representatives of the public schools, one from the State Department of Public Instruction and the other from the Teachers' Training Division. A suggestion for the inclusion on the committee of a manufacturer and distributor or jobber was laid on the table.

The objectives of this committee are given as follows:

To champion the cause of apprenticeship training in the State; to interest the people in the State plan for vocational education; to advise schools concerning how they can co-operate with the trade in training apprentices; to suggest ways and means of getting adequate training for all apprentices; to outline minimum qualifications for entrance to the trade; to suggest curriculum requirements; to set up qualifications for instructors; to suggest ways and means of training teachers; to recommend forms for keeping proper records; to suggest a plan for certifica-

STEAM TRAPS
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WHY LET THAT UNHEATED BUILDING WORRY YOU

We manufacture Unit Heaters and Fan Heating Systems for every need. If steam is not available, our all steel direct fired Fan Furnace will meet your requirments.

Send us your heating problems and we will show you the easiest and cheapest way.

Recommendations and prices furnished cheerfully without cost to you.

COMET UNIT HEATER
Suitable for use where steam and hot water is available. This Heating Ace is especially adapted where compactness and lightness in weight is of importance. For complete description write for Bulletin No. 85.

DIRECT FIRED FAN FURNACE
For use where steam or hot water is not available. For complete data write for Bulletin No. 90.

THE NEW YORK BLOWER COMPANY
CHICAGO, ILL. *Branch Offices in Principal Cities* LA PORTE, IND.

These 25 leading Boiler Manufacturers all use Sylphon Damper Regulators as Standard Equipment

No. 22—Sylphon Damper Regulator for low pressure steam boilers

No. 924 Sylphon Steam Damper Regulator, extra sensitive type

No. 45-A Sylphon Hot-Water Damper Regulator

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National
Oil City
Otis-Sawyer-Economy
Pierce-Pebco
Richardson
Ross
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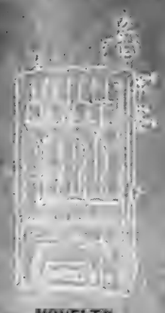
West Coast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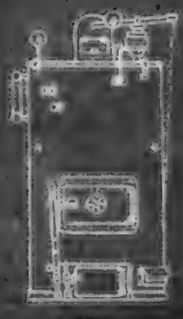
PIERCE-PEBCO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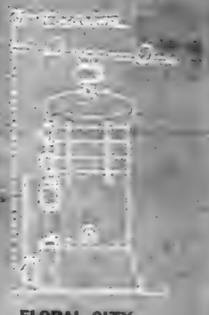
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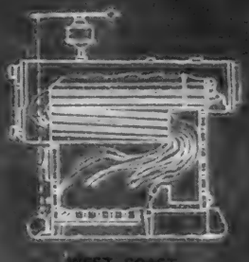
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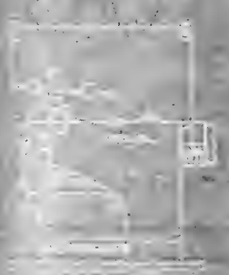
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Doesn't this look like a recommendation you should give heed to?

Remember these 25 leading manufacturers have decided on Sylphon Damper Regulators above all others. Why?

Because they are thus assured that their boilers will deliver the maximum heat with a minimum coal consumption. Why?

Because Sylphon Damper Regulators use (and no others can) the famous one-piece flexible, seamless, solderless Sylphon bellows as their diaphragm. This bellows, sensitive to the slightest variation in steam pressure or water temperature, powerful and free in its movement, *guarantees* an everlastingly accurate opening and closing of damper drafts.

Made in standard iron pipe sizes

May be installed on any make of boiler

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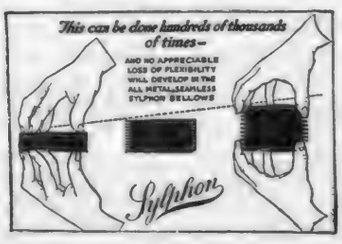
This can be done hundreds of thousands of times—
AND NO APPRECIABLE LOSS OF FLEXIBILITY WILL DEVELOP IN THE ALL METAL SEAMLESS SYLPHON BELLOWS
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tion of apprentices; to issue bulletins on approved standards and suggestions on apprenticeship training; and, finally, to co-operate with local joint apprenticeship commissions in working out their problems.

Among the powers and responsibilities of the local joint apprenticeship commissions, for which the plans provided, are:

To make a survey of conditions; to make apprenticeship rules; to find the instructor and recommend him to the school board; to test and register applicants for apprenticeship; to examine and provide certification of apprentices; to outline courses of study for the school, subject to State approval; to co-operate with the school board in establishing the school; and to safeguard the training of apprentices on the job.

The local joint apprenticeship commission would be expected to act in an advisory capacity in its relation with the local school board.

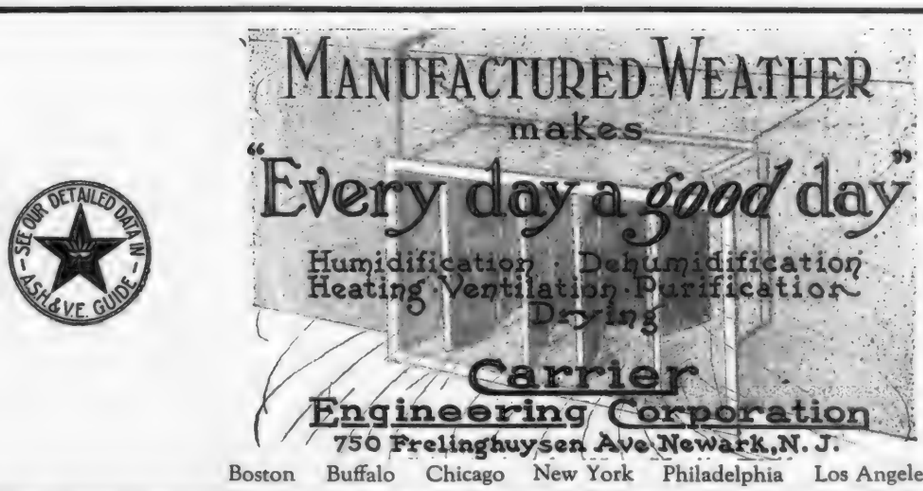
An entire morning session of the conference was devoted to the qualifications for apprentice instructors and their training.

The principles adopted, including the general plan of operation, were confirmed at a subsequent conference held at Harrisburg, Pa., September 16.

National Trade Extension Bureau Head Resigns—His Successor Appointed

After serving for six years as secretary-manager of the National Trade Extension Bureau, and being personally responsible for much of the growth and activity of the organization, William J. Woolley has, for personal business reasons, tendered his resignation. With sincere regret, and realizing the personal sacrifice that Mr. Woolley has made to carry out the work of the association, the directors were forced to accept the request. On September 10th, at a special meeting of the bureau held in Chicago, William G. Bergner of Granite City, Ill., was appointed to succeed Mr. Woolley. The retiring manager has long been a dominating figure in the work of the bureau and his personality and extraordinary ability to visualize, plan and organize, are largely reflected in the present status of the National Trade Extension Bureau. Mr. Woolley has been elected honorary vice-president of the bureau which will have the benefit of his advice and interest in the future. It is understood that Mr. Woolley has been elected vice-president and director of the Wolff Manufacturing Company and the Pierce, Butler & Pierce Mfg. Corporation, and will make his home in Chicago.

Following the announcement of the resignation of Mr. Woolley, President John J. Vogelpohl appointed a committee to select a successor. The committee met in Chicago on September 10th, and as the result of their deliberation William G. Bergner, a sanitary and heating contractor, of Granite City, Ill., was appointed and has accepted the position as secretary-treasurer of the National Trade Extension Bureau. Mr. Bergner is a successful contractor of the younger generation, being but 41 years old. He has been in the heating and plumbing business for 15 years and is held in high repute throughout the industry as well as in his own community. Mr. Bergner will not feel strange as an association executive. He served as president of the Illinois Master Plumbers' Association in 1923, and has been active in local and other organizations throughout his business life. The National Trade Extension Bureau is to be congratulated upon securing, not only the services of Mr. Bergner, but on being able to capitalize his capable and very pleasing personality.



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We are the Exclusive Manufacturers of O. S. Distributer and Circuit Fittings

For hot water heating they insure a positive, uniform circulation of the hot water with equal distribution to all radiators. They prevent short circuiting and increase circulation. They save labor, fittings, and joints.

Made in 39 sizes varying from ½ to 2½ inches.

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THE GROENIGER MANUFACTURING CO.
Michigan and Buttles Aves. COLUMBUS, OHIO

JAMES M. SEYMOUR
Established 1888
Lawrence St., Mechanic St. and Kirk Place,
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AUDITORIUM FANS, 36" to 120" to fit any squarer opening. SEYMOUR FANS sold subject to substantial discount. Furnished with suitable pulley or coupling for direct connection. TWIN FANS include shafting and center bearing.
Special Fans for Cooling Towers, Heating Systems, Induced Draft, Forced Draft, Dry Rooms, Dry Kilns.

SEND for BULLETINS, PRICES, and DISCOUNTS

Right from the Cost Sheets

BEFORE recent additions to our manufacturing facilities, we occasionally had to do what you do—buy fittings and hangers on the open market.

Each time we did this we found labor costs increased. And invariably these increases were traced to "Defective Material," as shown on the cost sheets kept by our installation foremen. However, we've reduced such losses to a minimum, once and for all.

And you, too, can cut down the labor costs that are due to "Defective Material." For you can now buy Grinnell Adjustable Hangers and Grinnell Flat Band Fittings—the self-same materials that are saving labor and speeding up work for Grinnell Company.

Nowhere can you find hangers so easy to erect and adjust—both before and *after* installation. The ingenious, time-saving swivel-shank is an exclusive patented Grinnell feature.

Grinnell Cast-Iron Fittings are the last word in quality. You can use hundreds upon hundreds of them without finding a single sand hole. Threads are absolutely accurate—cores are smooth and clean.

Write for the free 120-page Grinnell Hanger Catalog. Its illustrations and text will tell you all about the handiest and most complete line of hangers on the market. Address Grinnell Company, Inc., 280 W. Exchange Street, Providence, R. I.

GRINNELL

Fittings, Hangers, Valves, Pipe Bending Welding, Piping Supplies, Etc.

Artistic Street Warning Signs

Another sign of the times in line with the use of better and more presentable scaffolding is the adoption of artistic signs in place of the usual "Men at Work" barrier.

In the accompanying illustration is shown a typical sign of this sort used

Street Warning Sign Used by Western Utility Company

by the Pacific Gas & Electric Company. The sign is a knock-down affair and can be quickly dismantled and transported. At the ends of the sign are receptacles for holding the danger flag and also hooks for carrying red lanterns at night.

WANTED

Advertisements under this heading, $2.00 per inch, payable in advance. A 1-in. advertisement contains 35 words. To secure insertion copy must be received not later than the 20th of the month preceding date of issue.

HEATING AND VENTILATING DRAUGHTSMAN — Six years' experience, graduate of Cooper Union evening school; evening high school; also other training, wishes part time work, so as to enable him to finish technical education during the day. Address Box 101, care Heating and Ventilating Magazine.

DISTRIBUTORS WANTED—Manufacturer of complete line of steam traps, automatic air valves, thermometers for hot water boilers, calorifiers, mixing valves, etc., automatic temperature regulators, ventilating and heating recording devices, etc., of the highest efficiency and latest construction, having had many years of successful installation, seeks live, responsible, well connected distributors. Great money making opportunity. For further particulars and samples, address Box 102, care Heating and Ventilating Magazine.

HEATING SALES ENGINEER, draftsman, estimator, trouble shooter. About 25 years' experience on all heating work, seeks connection with boiler, specialty or sundry house, or contractor. Call on architects, engineers, trade or owners. Headquarters New York. Executive ability. A.S.H.V.E., A.S.M.E. New York license. Address Box 104, care Heating and Ventilating Magazine.

SALES ENGINEER WANTED, in the principal manufacturing centers of the United States, to sell on commission industrial ovens for japanning, enameling, lacquering, drying, etc. Those desiring to add equipment of this type to their present line are invited to communicate with Skinner Bros. Mfg. Co., Elizabeth, N. J. Give full particulars concerning present line, references and territory covered.

GENERAL FAN LINE WANTED—Live mid-western heating company, specializing on nationally known blast heating equipment desires to represent manufacturers of nominal priced, fair quality equipment. Will make arrangements to expand such department, if warranted by demand. Address Box 103, care Heating and Ventilating Magazine.

HEATING ENGINEER WANTED—A capable and experienced low pressure heating engineer to manage sales and engineering in Eastern branch of prominent, long established and nationally known company. One who can produce sales and intelligently supervise layouts for vapor heating and who is thoroughly acquainted with architects, engineers and heating contractors in New York, Philadelphia and surrounding territory. Age, references and experience required with application in own hand writing. Address Box 105, care Heating and Ventilating Magazine.

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Your valuable inventions
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Prompt attention. Superior Service
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Makes any Vapor or Modulating System safe and satisfactory. Sensitive to the slightest change in pressure. Has ample power to control the dampers with a good working margin.

Full power of regulator is exerted within a pressure range of two or three ounces.

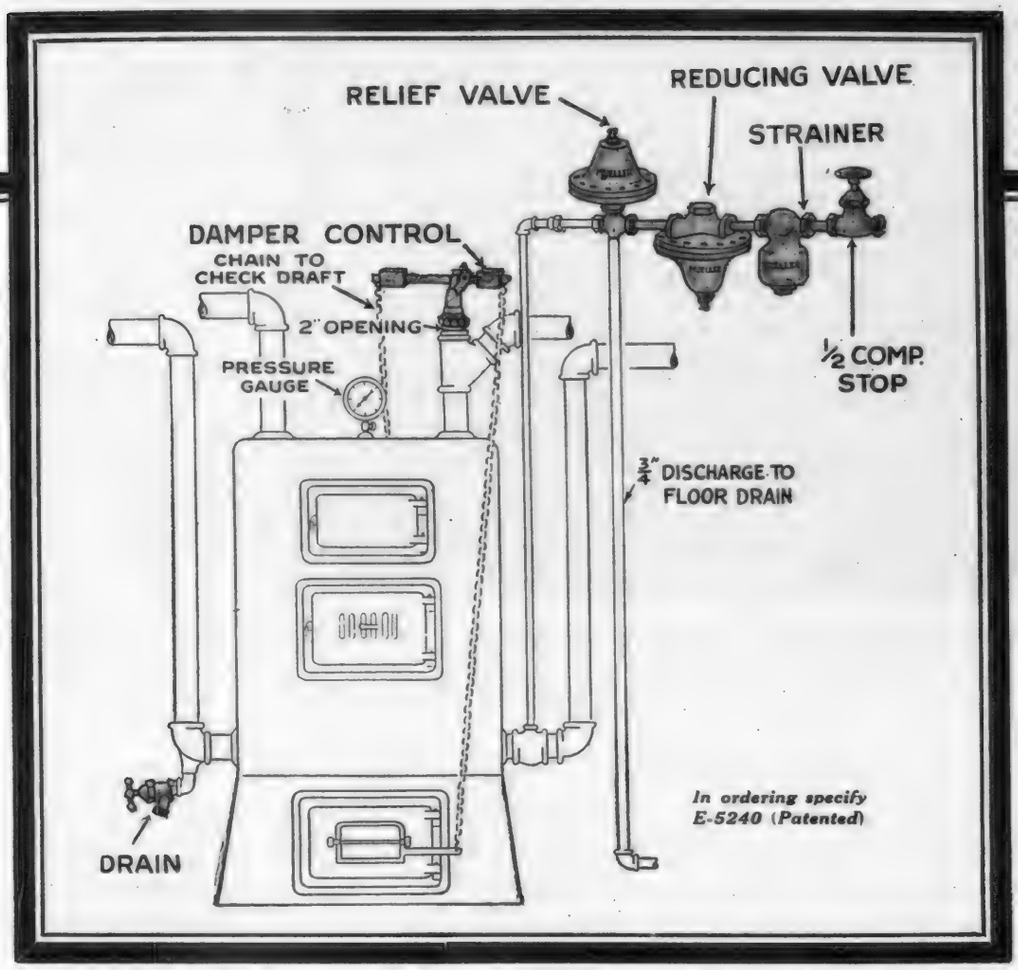
The Safety Vent Valve is a distinguishing feature of this regulator and takes care of air from entire heating system.

Tested and carefully adjusted before leaving factory, ready to be connected up and put into service, with the least trouble and expense.

All working parts of cast bronze. Will last as long as the boiler, or any other part of system.

Write for details

SIMPLEX HEATING SPECIALTY COMPANY, Inc.
LYNCHBURG, VA.



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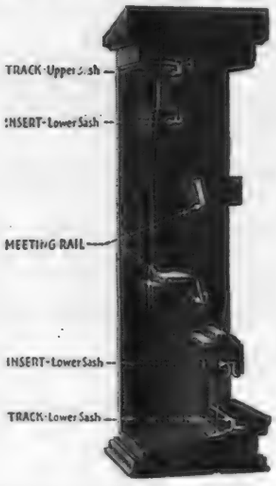

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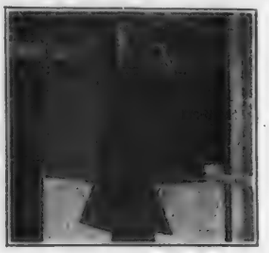

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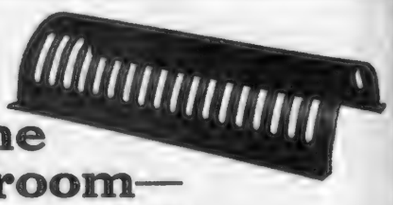

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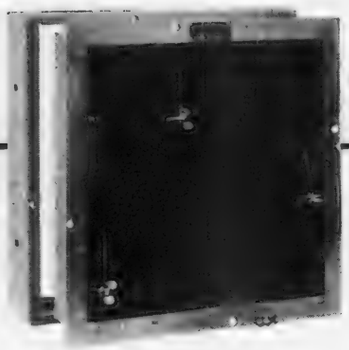

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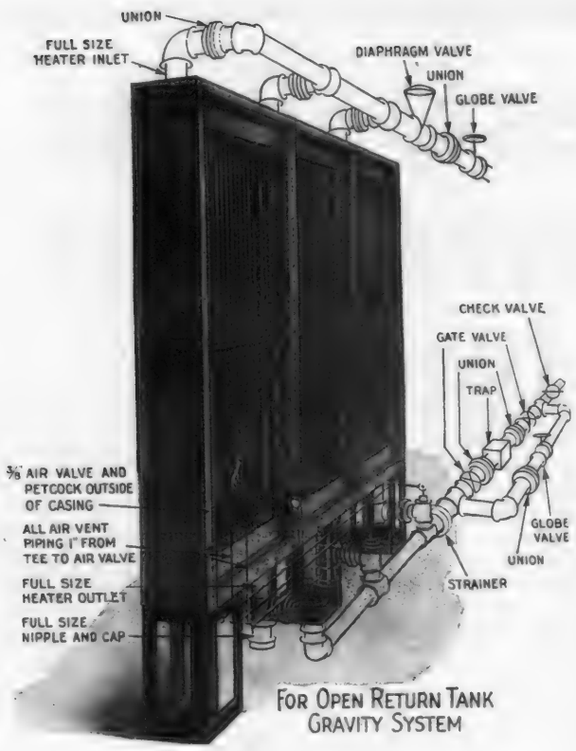

AEROFIN CORPORATION
750 Frelinghuysen Avenue
Newark, N.J.
L. C. Soule, *Sec'y and Chief Engineer*

AEROFIN

Fan-System Heating Surface

To Engineers, Architects and Contractors

THREE YEARS OF SUCCESSFUL SERVICE demonstrates that AEROFIN has established itself as a dependable product.

ENGINEERS OF NATIONAL REPUTATION AND TWENTY YEARS' EXPERIENCE WITH FAN SYSTEM HEATERS, are responsible for the design, development, manufacture and marketing of AEROFIN, and their services are at your command to assist you in working out your heating, ventilating, cooling and drying problems.

SINCE THERE IS NO EQUAL TO AEROFIN, WHY NOT SPECIFY IT OUTRIGHT? Plans and specifications should show sizes and number of units, with piping details.

AEROFIN HAS A TREMENDOUS ADVANTAGE in its LIGHTWEIGHT. AEROFIN weighs only 9% to 25% as much as the old-fashioned heavy heaters. AEROFIN SAVES A GREAT DEAL OF SPACE.

AEROFIN IS MADE OF NON-CORROSIVE METALS. This feature meets with universal approval.

THE INSTALLED COST OF AEROFIN IS GENERALLY LESS than that of cast-iron heaters and pipe coils. AEROFIN (completely encased) can be erected in the same number of HOURS as is required in DAYS to erect the heavy heaters. This means a great saving in erecting cost.

THE INSTALLATION OF AEROFIN WITH VERTICAL TUBES IS RECOMMENDED as this arrangement is less subject to errors of installation and operation. THE HORIZONTAL TUBE ARRANGEMENT is satisfactory when installed in accordance with our instructions and diagrams.

Write for catalog, instruction leaflet and service details.

Aerofin is Sold ONLY by Manufacturers of Nationally Advertised Blower Heating Apparatus.

—and a profitable business too!

Besides rendering a good service to your customers, there is also a profitable business in handling **C. S. B. APPROVED SPRINKLER HEADS.**

They can now be bought from us direct either separately or with all the other necessary equipment for sprinkler systems. Use your own pipe and your own crew and get the business.

Also, after a fire, sprinkler heads have to be replaced. A stock should be kept on hand for demands of this nature.

Write us for prices and details. We cooperate with you in every way.

C. S. B. SPRINKLER CO.
54 Batterymarch St. Boston, Mass.
Factory: Laconia, New Hampshire

SHUR-TITE

—The Economical—

BOILER CEMENT

Reg. U. S. Patent Office

POSITIVELY GUARANTEED to seal leaks in Boiler and Radiator Sections. Just the thing to use on new heating installations before tests are made, because SHUR-TITE BOILER CEMENT will find and quickly seal all leaks that occur in new heating jobs.

Any jobber can supply you, or write us for liberal trade discounts.

The Shur-Tite Mfg. Co.
1912 Cleneay Ave., Norwood, Ohio

Universal Unit Ventilation System

EVERY child loves the out-doors and thrives on its fresh air and invigorating elements. The UNIVERSAL UNIT duplicates this condition in the classroom.

The new UNIVERSAL UNIT Catalog and Engineers Data Book is now ready. Where Shall We Send Your Copy?

The Universal Unit

"The standard by which all other makes are measured"

(REG.—U. S. PATENT OFFICE)

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TWINFAN Unit Heaters

When 1 is More Than 17

THE TWINFAN Unit Heater, illustrated here, has as much heating capacity as seventeen ordinary radiators. From that standpoint, therefore, one equals seventeen.

But from the contractor's standpoint one is actually more than seventeen for the profit on the installation of one TWINFAN Unit is certain to be more than on the seventeen radiators.

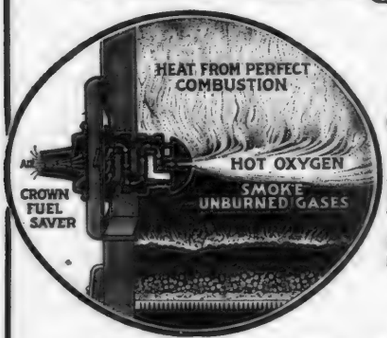
Naturally, with the single heating unit you have approximately 1/17 as much piping to place and 1/17 as many connections to make, cutting the total labor on the job proportionately. You probably realize from sad experience how uncertain the profit is on jobs that are principally labor. So you can readily see that the profit is greater and more certain on the one-unit job than with seventeen units.

The customer will also get more heating satisfaction out of the one TWINFAN Unit than from the seventeen radiators. The unit heater easily controls the heat and keeps it down where it is needed.

Let us co-operate with you on your next industrial heating job.

DWYER EQUIPMENT COMPANY
4534 W. NORTH AVE. CHICAGO, ILL.

We Guarantee
a Coal Saving of 20%



to users of the

CROWN
Fuel Saver
Smoke Abater

THIS automatic device is easily attached to the feed door of any style heating plant. Its scientific design permits the inflow of superheated air over the firebed causing a secondary combustion of the gases and smoke which would otherwise pass up the flue.

A Proven Success!

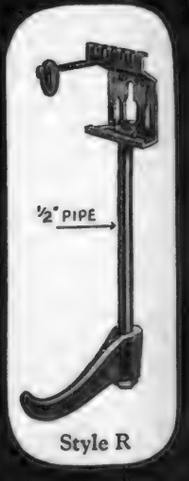
Thousands have been successfully installed during the past ten years. Satisfied users and our National Advertising makes the Crown a ready seller. Write today and learn about the long profit to distributors.

CROWN FUEL SAVER CO.
70 North 10th Street RICHMOND, IND.
Sole Canadian Distributor; 33 St. Vincent St., Montreal, Can.

EZ RADIATOR HANGER
YOU'LL USE 'EM YET!

Allows easy cleaning under radiators. No dust to stain walls above radiators. No hot legs to mar floor finish.

Write for ALL the advantages.



HEALY-RUFF CO.
772 Hampden Ave.,
St. Paul - - Minn.

Clean Air for Hospitals

Cell and frame of the New Model Type U-2 Midwest Air Filter

OUTSTANDING FEATURES OF MIDWEST AIR FILTERS

An installation is built up of standard, interchangeable units (consisting of a frame and a filter cell 20 x 20 x 6½" overall, with a capacity of 800 C.F.M. per unit). A positive air-seal is provided between each cell and frame, and between adjoining frames on all sides.

The unique Midwest baffle-impingement principle makes these filters the most efficient air cleaners in existence. The filter medium consists of a series of specially shaped and perforated metal sheets coated with a sticky viscous fluid. Dusty air in passing through the filter cell, is forced to change its direction innumerable times.

Dust particles are impinged against the sticky surfaces of the filter sheets, where they are caught and held. A series of specially designed sheets of knitted metal mesh are provided at the rear portion of the cell, on which fine dust particles which might pass the first filter sheets are impinged and caught.

Each cell holds a large amount of dust and does not clog up. A constant operating resistance of ⅜" water gauge is maintained by routine cleaning. One man, on a small part of his time, takes care of the average installation.

HOSPITALS certainly need clean air, if only because of the dangers of infection from the bacteria carried by atmospheric dust. Operating rooms, emergency and surgical wards are particularly affected, but the spread of contagious diseases to all parts of a hospital by dust-borne bacteria is a contingency that cannot be overlooked.

Of course the usual reasons for supplying clean air to any building are equally applicable to hospitals.

Engineers, architects and medical authorities recognize the superior service of Midwest Air Filters in supplying clean air free of harmful dust and bacteria to hospitals.

The installations ordered so far in 1925 are already far in excess of all those received in 1924.

Here are a few recent installations:

BETH ISRAEL HOSPITAL, New York, N. Y.
HANOVER GENERAL HOSPITAL, Hanover, Pa.
ST. ELIZABETH'S HOSPITAL, Boston, Mass.
ST. FRANCIS HOSPITAL, Freeport, Ill.
UNIVERSITY HOSPITAL, Ann Arbor, Mich.

If you have any hospital work on your hands now, ask Dept. F-4 to show you how Midwest Air Filters can be installed.

MIDWEST AIR FILTERS

INCORPORATED
100 EAST 45TH STREET
GRAND CENTRAL TERMINAL BLDG.
NEW YORK, N. Y. U. S. A.

Midwest Canada Ltd.
83 Craig St. West
Montreal, Canada

Midwest Pacific, Inc.
Monadnock Building
San Francisco, California

A Guarantee of Service!

Back of the superlative service of every Foxboro Indicating and Recording Instrument is the marvelous and painstaking accuracy with which it is made.

A secret process enables Foxboro craftsmen to draw each Helical Tube so that it has the same characteristics as every other tube. Because the characteristics of every tube are known:

Foxboro Instruments are guaranteed to be accurate within less than 1 percent of total scale range.

The Foxboro Helical Tube is guaranteed not to split, leak, set, or crack even when subjected to excess temperatures or pressures.

THE New 3-A Chart Holder is the latest improvement in chart retention and is an exclusive Foxboro feature.

The chart slips into true center, is held securely and yet a twist of the tension head turns the chart to the correct time adjustment. Interchangeable with present chart holders.

Lost motion has gone because twiddling adjustments have gone.

Pen points are so polished that they glide over mile after mile of chart travel as smoothly as a shadow.

Every part of a Foxboro Instrument—clock, chart, capillary tubing, bulb—is the best that can be made.

In more than a quarter century of service, Foxboro Instruments for indicating and recording temperature, pressure and humidity, have earned the admiration of all industry.

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New York Chicago Boston Philadelphia Pittsburgh
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FOXBORO

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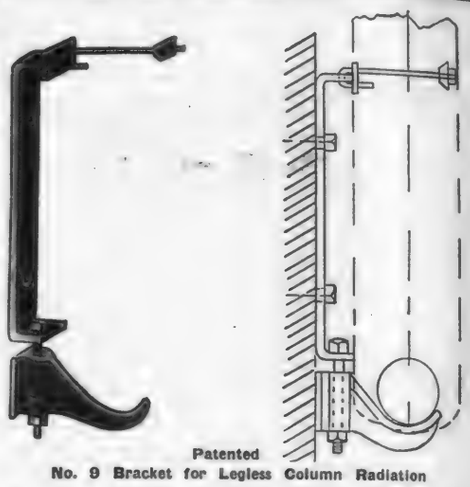
THE COMPASS OF INDUSTRY



Patented
No. 9 Bracket for Legless Column Radiation

GLEOCKLE fits them all

It is not necessary to know the make of wall radiator to be used. Just specify Gleockle Adjustable Wall Radiator Brackets and your bracket requirements will be filled. They are made to fit any make of wall radiator, and besides being convenient, they are safe, durable, inexpensive and invisible after erection.

Send for descriptive booklet and trade discount

FIT ANY MAKE OF RADIATOR

A. F. GLEOCKLE, Jr.

415 Bay Street ROCHESTER, N. Y.

Improved Rotary Type 22

This cut shows a complete installation of Underground Oil Storage Tank-Piping and Johnson Improved Rotary Oil Burners. Note—How Simple—and Safe. Can be readily installed in most any Boiler Heater or Furnace. Patented features of Centrifugal Atomization permit the cheapest grade Fuel Oil to be pumped and burned with high economy and satisfactory service—Listed as standard by Underwriters' Laboratories.

Write for Our Latest Bulletin No. 28D, describing and listing this Oil Burner Masterpiece.

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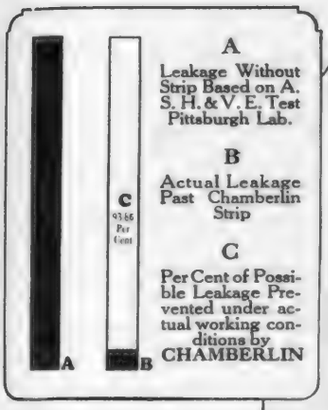
28 YEARS OF FUEL SAVING
with Chamberlin Equipment

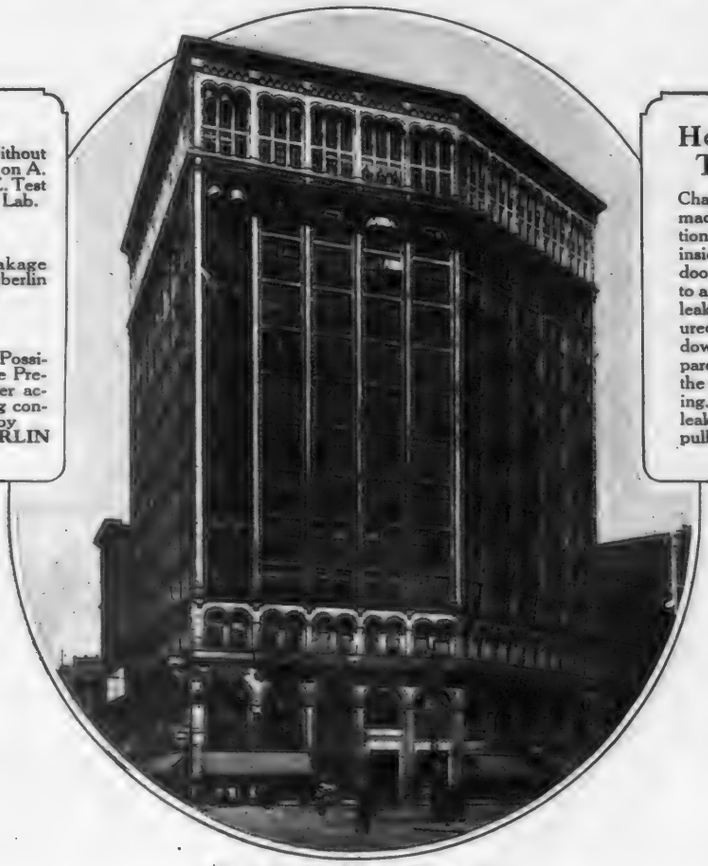
How Proper Weatherstripping of Buildings Assists the Heating Engineer



A
Leakage Without Strip Based on A. S. H. & V. E. Test Pittsburgh Lab.

B
Actual Leakage Past Chamberlin Strip

C
Per Cent of Possible Leakage Prevented under actual working conditions by CHAMBERLIN



Majestic Building, Detroit. Equipped in 1896 with Chamberlin Metal Weather Strips. Tested December 12, 1924, with results shown above.

How Chamberlin Tests Are Made

Chamberlin installation tests are made by placing an air collection chamber over the entire inside of a window. Opposite doors and windows are opened to aggravate circulation. The in-leakage past the strip is measured with an anemometer. Windows are not especially prepared for test and are always on the windward side of a building. In-leakage always includes leakages through the frame and pulley holes.

Keeping large buildings warm and comfortable with minimum expenditures for heating equipment and fuel is not alone a problem of the heating engineer.

Unless an office structure or public building is correctly weather-stripped, heat losses occur at doors and windows destroying the efficiency of the most adequate heating system.

Chamberlin Metal Weather Strips give years of protection against weather and high fuel bills, as shown by the test of the Majestic Building, Detroit.

Installed 28 years ago, the Chamberlin equipment on this building is still preventing 99.3% of possible in-leakage of air.

Heating engineers recommending Chamberlin Metal Weather Strips can assure their customers of a design and installation constantly improved in every year of our history.

Only Chamberlin among all weather strip manufacturers guarantees every installation for the life of the building.

CHAMBERLIN METAL WEATHER STRIPS
SINCE 1893-THE STANDARD

Send for Copy of New Catalog

This book of details and specifications has been pronounced the most complete of its kind ever issued. Mail coupon for copy.

CHAMBERLIN
METAL WEATHER STRIP CO., INC.
Detroit, Michigan

80 Sales and Service Branches Throughout the United States

Chamberlin Metal Weather Strip Co.
Detroit, Michigan

Please send free copy of your new Detail Book. Also copy of illustrated booklet to show my clients.

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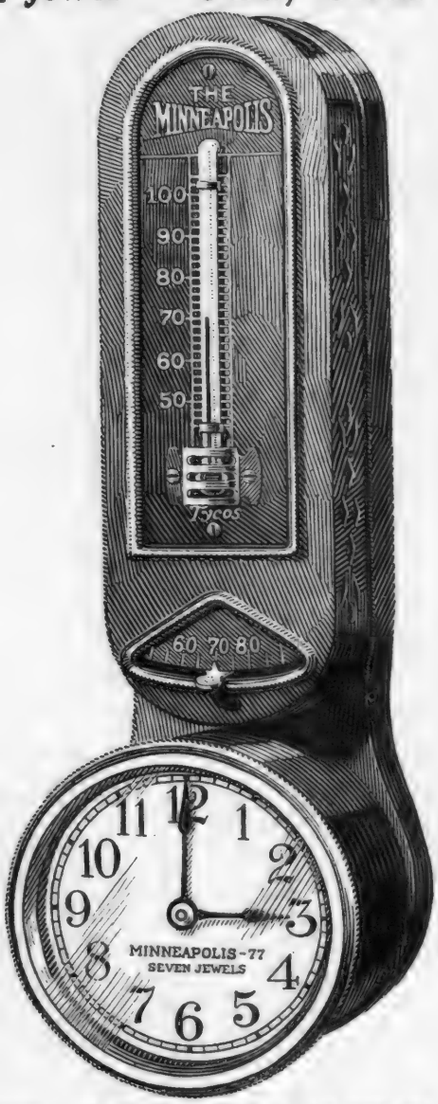
The New MODEL 77

7-Jewel 8-Day Clock



Experience—40 years of it—built this new and better **Model 77 Minneapolis Heat Regulator.**

Experience—made possible the great simplification; the more dependable construction throughout.

Experience—showed us the importance of building this peer of all heat regulators complete, clock and all, in our own factory, under the supervision of Minneapolis experts.

Experience—of users of this new, moderately priced Minneapolis has demonstrated that Minneapolis performance is incomparable. Everywhere Model 77 is acclaimed the perfect heat control device.

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Established 1885
2804 Fourth Ave. So. MINNEAPOLIS, MINN.

The "MINNEAPOLIS" HEAT REGULATOR
for COAL—GAS—OIL

TRADE MARK
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Accurate Record Means Close Control

The closeness with which temperature may be controlled depends first upon the accuracy of the method employed for measuring and recording the temperature.

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Bristol Records make possible the closest kind of control for they are accurate.

The Bristol Company *Waterbury, Connecticut*
FOR 36 YEARS — Ask Any Technical Engineer — MAKERS OF
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Better Quality. Lower Cost.

A hot water temperature regulator that is NOT self-contained. Sold with AN ABSOLUTE GUARANTEE. Responds instantly. No volatile fluids. All metal. Write for full particulars.

ATLAS VALVE COMPANY
REGULATING VALVES FOR EVERY SERVICE
281 SOUTH ST., NEWARK, N. J.

American S & B Instruments

reduce manufacturing costs, eliminate spoilage, and increase efficiency. They are the result of over 75 years' experience in solving problems of temperature, pressure speed, etc.

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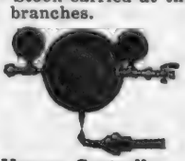
AMERICAN SCHAEFFER & BUDENBERG CORP.
BROOKLYN, N. Y.

*Boston, Buffalo, *Chicago, *Los Angeles, Cleveland, Detroit, Tulsa, Philadelphia, *Pittsburgh, Salt Lake City, *Seattle
* Stock carried at these branches.


Honeco Controller

American S & B Pressure Gauge

Columbia Recording Thermometer

Trade Mark

Made in boards 12 inches by 32 or 36 inches—from 1 inch to 3 inches thick.

Heated Last Winter With Natural Gas for $110.20

THE residence of Mr. W. H. Larimer, Pittsburgh, Pa., illustrated above, is 34 x 26 feet with finished third floor, and contains nine rooms, two baths and a center hall. It is heated with a thermostatically controlled hot water system using natural gas for fuel, yet the total gas bill last winter was only $110.20.

To quote from Mr. Larimer's letter of August 11, 1925:

"The gas was lighted October 22, 1924, and from that date to April 18, 1925, our total gas bills amounted to $110.20, using 60-cent gas. No other fuel was used and the temperature ranged from 70 to 72 degrees *both night and day.* Included in this total is the gas used for cooking, instantaneous hot water heater, laundry, garage, etc.

"We heat the entire three floors and find all parts of the house comfortable and the temperature practically uniform."

The reason for such an unusual record? The exterior walls and roof of this house are lined with 2 inches of Armstrong's Corkboard which so reduced the heat loss through the construction that fully 31% less fuel was burned than if no insulation had been used. Mr. Larimer has never used more than three of the five burners under his boiler.

The effect of cork insulation on the "heatability" of a house is a factor that vitally concerns all contractors and engineers. For the cork lined house is so much easier to heat that you can safely install a smaller system, which will save money for your customer not only in first cost, but in operating cost as well. And customer satisfaction is the quickest and surest route to bigger and better business.

Complete information regarding the reduction of heat losses through all types of cork insulated construction will be supplied promptly on request. Address, Armstrong Cork & Insulation Company (*Division of Armstrong Cork Company*), 202 Twenty-fourth Street, Pittsburgh, Pa. Canadian office, McGill Building, Montreal, Quebec.

Branches in the Principal Cities

Armstrong's Corkboard Insulation

for Residential, Commercial and Industrial Buildings

It's Easy to Understand *Why*

Commonwealth Lavigne Radiator Valves Are a Better Value

THE new "knobby-grip" handle and the forged brass tail nut are obvious points of superiority—but examine the valve more closely. Observe the careful manner in which these valves are finished, notice the large body area and ample thread space, feel the weight of the valve and test it for smooth operation—and, finally, place it side by side with a valve of any competitive make. Do this and you cannot but be impressed by the fact that Commonwealth Lavigne Radiator Valves are the outstanding value on the market today.

Your Jobber Can Supply You

COMMONWEALTH BRASS CORPORATION
DETROIT, MICH.

LAVIGNE COMMONWEALTH
RADIATOR VALVES

Radiator Valves are "in season"

Fig. 167. *Jenkins Bronze Radiator Globe Valve, with male union.*

Fig. 168. *Jenkins Bronze Radiator Angle Valve with male union.*

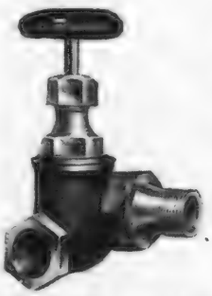


Fig. 180. *Jenkins Right Hand Radiator Corner Valve, offset pattern, with male union.*

Whether you're putting in new systems or overhauling old ones, it pays you to know the Jenkins "Diamond" is on every valve you use.

This mark identifies a valve that stands the hardest service—a valve that gives owners a lasting good impression of your work.

Piping expansion and contraction, lifting and settling, do not affect a Jenkins Radiator Valve. It is built with extra strength to resist these stresses.

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80 White St.....New York, N. Y.
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JENKINS BROS., LIMITED
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Always marked with the "Diamond"
Jenkins Valves
SINCE 1864

Quick repairs by the oxy-acetylene process are made possible by easily portable cylinders of

Prest-O-Lite
DISSOLVED ACETYLENE

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31 Plants—71 Warehouses—22 District Sales Offices

KENNEDY

Standard Swing Check Valves

Fig. 106

THESE valves are straightway, having a direct passageway the full area of the pipe. The disc revolves and is self-adjusting. The angle at which the disc is placed makes the valve open easily at the lowest pressure, and helps to avoid the shock of closing under high pressure.

These features render the Kennedy check valves more desirable than the ordinary check valve, as they do not stick on the seat, are thoroughly reliable and positive in operation, and may be used equally well in either a horizontal or a vertical position.

The Kennedy catalog fully describes and lists these valves together with the entire Kennedy line of over 4600 different types and sizes of valves and fittings.

Send for a copy

THE KENNEDY VALVE MFG. CO. ELMIRA, N.Y.

Branch Offices and Warehouses
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BOSTON: 47 India St.
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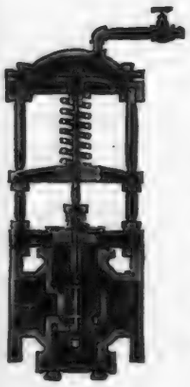
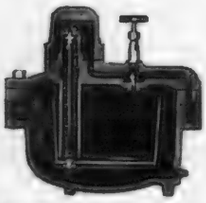


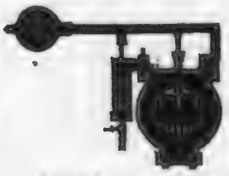
Manufacturers of a Complete Line of Specialties For 46 Years

This illustration shows a Rockaway Pressure Reducing Valve, one of the various types we manufacture. Other types, lever weighted, pilot piston operated and hydraulic operated.



Steam Traps, Bucket and Ball Float Types. All Pressures.

Catalog on Request

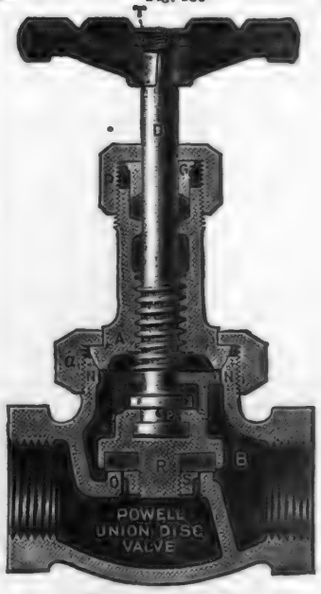


Back Pressure Valves, Noiseless Type, Spring or Lever weighted. Sizes 2" to 30"

KIELEY & MUELLER, Inc.
34 West 13th St. New York City

POWELL VALVES

Fig. 150



UNION COMPOSITE DISC VALVES

ALWAYS DEPENDABLE

For Hot Water or Steam Heating

Notice the Union Bonnet Connection

Ask your dealer for Powell Valves

Sizes ⅛ to 3 inches

The Wm. Powell Company
Cincinnati, Ohio

ANNOUNCING
A NEW
SERVICE
TO OUR
CUSTOMERS

Your name can now appear on ARCO Packless Valves

YOU can now advertise your business in all the homes where you install high-grade heating jobs. You can get display space in the best living rooms and dining rooms —space that no one else can buy for love or money.

By etching your name in nickel on the black dial of each ARCO Packless Valve, we will enable you to secure this valuable advertising for your business.

This service puts your advertisement on every valve you install. It identifies your shop with the quality of ARCO Packless Valves. It gives you the direct benefit of the millions we have spent in advertising ARCO products.

Ask your American Radiator Company salesman about this new feature, or write to us for a circular of various styles of lettering.

AMERICAN RADIATOR COMPANY

IDEAL Boilers, AMERICAN Radiators, ARCO Valves and Regulators

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Patented

"Master Control" Valve

New Thermostat makes possible a simplified construction

The Automatic Switch Control Box is now made a part of the motor bracket unit, because the new Thermostat being suitable for contacting on either 110 or 220 volts direct no low voltage transformer is required.

Armored cable is used to connect thermostat to motor switch, making this installation most desirable in Industrial Buildings, Stores, Offices, Schools, Hospitals, etc.

The method of construction heretofore used will be continued, for use in such places as residences, where the running of armored cable might be less desirable than that of the low voltage thermostat cord.

Either style of "Master Control" is sold on a sixty days' trial basis.

Ask for Bulletins and complete information about this efficient heat controlling system.

Heat Loss is Money Loss

Central Heat Appliances, J. C. Hornung Engineer **343 So. Dearborn St., Chicago**

"Keeping Others In Hot Water"—

for
Hotels, apartment buildings, hospitals, Y. M. C. A. buildings, schools and laundries

Special Attention Given to Installations Requiring Large Quantities of Hot Water, with Live or Exhaust Steam as the Heating Medium.

—may be a pastime for some folks, but for the Sims Company it is a serious proposition—a matter requiring a thorough knowledge of hot water requirements.

A long study of these requirements enables us to offer heaters that assure constant and efficient hot water service.

Engineers feel safe in specifying "SIMS" because they know it means **reliability**—a service you want to render your client.

SIMS CLEAN E-Z STEAM TUBE STORAGE HEATER

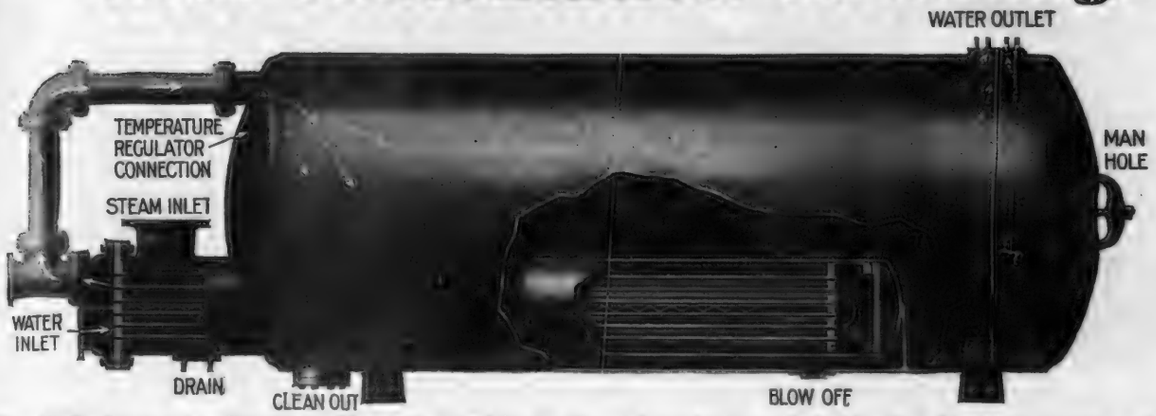
Our Engineers will gladly confer with you, without obligation, on your hot water problems.

THE SIMS CO.

Erie, Pa.

A good place to live, to work and to play.

A combination heater with combination advantages



The G-R Instanta Storage Heater combines the advantages of both the Instantaneous and the Storage Type Heaters without the limitations of either.

Operation:

1. Incoming cold water enters tubes of instantaneous heating element and is heated by the steam in instantaneous heater shell.
2. Water then passes through the exterior pipe to the storage shell.
3. The inner heater shell filled with steam keeps the stored water hot.

Advantages:

1. Instantaneous heating when required.
2. Tremendous overload capacity.
3. Storage of hot water against sudden draws.
4. Floating head construction—no strains.
5. Any tube replaced easily without disturbing others.
6. Less space and less piping than an instantaneous heater and separate storage tank.

Write for full information

THE GRISCOM-RUSSELL CO., 2155 West St. Bldg., New York

Offices in all Principal Cities

Divorces are Expensive!

The man who is choosing valve equipment might be compared to the young man who is about to choose a wife. Both the wife and the valve equipment must be lived with afterwards, and divorce is both undesirable and very expensive.

Valves are really important items. A valve is not merely a mass of bronze or iron with a stem and a wheel. Properly designed and constructed valves are the product of engineering skill and there is as much difference in their makeup as in the clothes that people wear.

Standardize on Scott Valves. Over fifty years of valve engineering experience is woven into the perfected Scott Valve line of today.

The famous Scott No. 1 Gate Valve

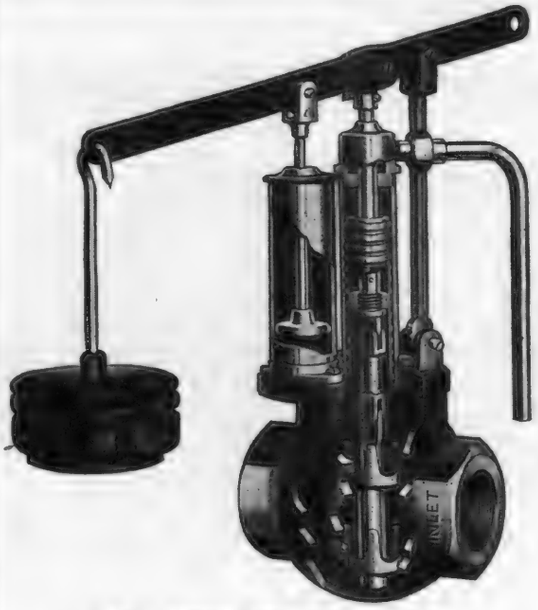
Scott Valve Manufacturing Company

3963 McKinley Avenue **Detroit, Michigan**

SCOTT SINCE 1886 VALVES

SIGN OF VALUE

"MAXIMUM SERVICE PER DOLLAR"



No. 1 Pressure Regulator—Piston Type
Made in sizes ⅜ to 14 in. inclusive—Std. and Ex. Hvy.
Sizes 1½ in. and under made with bronze bodies—screwed ends only.
Sizes 2 to 6 in. inclusive made with iron bodies—screwed or flanged ends.
Sizes 7 in. and above made with iron bodies—flanged ends only.

KLIPFEL
PRESSURE REGULATORS

Automatically reduce any initial steam, air or water pressure to any desired reduced pressure above 2 lbs.

Maintain reduced pressure constantly regardless of fluctuations in boiler pressure, or changes in the demand for steam.

Simple, rugged and direct acting. As low pressure builds-up and exerts pressure under piston, a balance is formed between low pressure and weighting, which in turn regulates the inner valve opening.

Visible in action. Lever may be used to open, close or test by hand. Position of inner valve may be easily judged by looking at the lever.

Bronze cylinder, multiple grooved piston and balanced plunger type bronze inner valve. All working parts removable while valve body remains in the pipe line.

No troublesome springs, toggles, packing boxes or pilot valves. Dashpot included, which insures steady service pressure and overcomes any tendency of valve to chatter or vibrate.

Guaranteed to closely regulate at maximum steam loads, as the capacity—size for size—is equal to or greater than that of any competing pressure regulator.

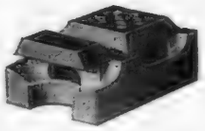
We Invite Correspondence.

KLIPFEL MFG. CO., 2641-59 W. Harrison St. CHICAGO, ILL.

Manufacturers of a Complete Line of Steam Specialties including Expanded Outlet Pressure Regulators (Both Piston and Diaphragm Types)—Float Valves—Pump Governors—Back Pressure Valves—Relief Valves—Grease Traps—Steam Traps and many other Specialties.
Sold by Leading Jobbers in all Principal Cities—Write for Catalog No. 20.

Has the Coal Strike Forced You to Pay Higher Prices?

Many plants have been forced to pay higher prices, due to the coal strike.
PYRAMID GRATE users meet this situation by burning Buckwheat coal in various sizes, costing up to $6.00 per ton.



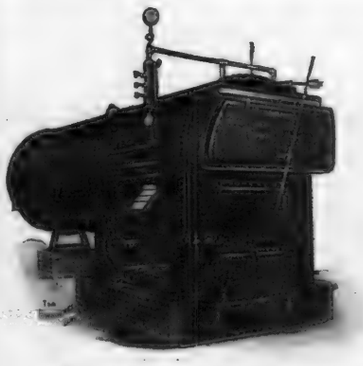
The same opportunity awaits you.

PYRAMID IRON PRODUCTS CO.
136 Liberty Street New York City

CENTRAL STATION STEAM CO.
2912 East Woodbridge St.
DETROIT, MICHIGAN

MANUFACTURERS OF
Cadillac Condensation Meters
Detroit Feed Water Meters

Packingless Expansion Joints and other special fittings for underground steam distribution mains.



Brownell Return Flue Portable Heating Boiler—Smokeless Type

BROWNELL

Better Boilers for Heating and Power Purposes
70TH YEAR

of successful manufacturing experience. This is the reason why Brownell Boilers are specified by all the leading Heating and Contracting Engineers.
BROWNELL Steel Heating Boilers are
LOW IN FIRST COST
HIGH IN EFFICIENCY
BUILT TO LAST A LIFETIME
Our reputation is your insurance of a high quality product. Let us solve your heating problems. Sales representatives in all principal cities. Send for them.

THE BROWNELL CO.
DAYTON, OHIO

THE BROWNELL COMPANY The World Over SINCE 1855 DAYTON, OHIO, U.S.A.

Established 1855

Send for Bulletins B6 B6A

BOILERS

PIPE HANGER SHELL WITH GAS PIPE HANGER
ROD HANGER SHELL TYPICAL METHOD OF BOLTING MEMBERS TO CONCRETE
STRAP HANGER SHELL WITH STRAP HANGER
ROD HANGER SHELL WITH ROD HANGER
ROD HANGER SHELL WITH EYE BOLT HANGER
ROD HANGER SHELL WITH EYE BOLT HANGER

Installing Self-drilling Shells in Concrete.

Phillips self-drilling Expansion Shells

For fastening all types of hangers to concrete ceilings, side beams, columns, and walls, and for bolting timbers and other equipment to concrete and stone.

Every shell is a drill and makes its own hole, thus eliminating drill trouble and expense.

A new sharp drill for every hole and a smaller hole per given size bolt, reduces labor cost of installing to absolute minimum.

A perfect fitting hole and the enlargement of shell and hole at extreme bottom, insures reliability and better workmanship.

Quickly installed with the Phillips Spring Hammer, or with special hand chucks.

PHILLIPS DRILL COMPANY

1537 Cortland St., Chicago, Ill.

Ceiling with Phillips Spring Hammer Drill

No Waiting for Hot Water

with Dahlquist Aquatherm Copper Range Boiler

INSTEAD of having to wait for a whole tank of water to become heated, you may have instant hot water at a minimum cost by installing a **Dahlquist Aquatherm Copper Range Boiler.**

It is connected the same as an ordinary range boiler and can be furnished in any size desired.

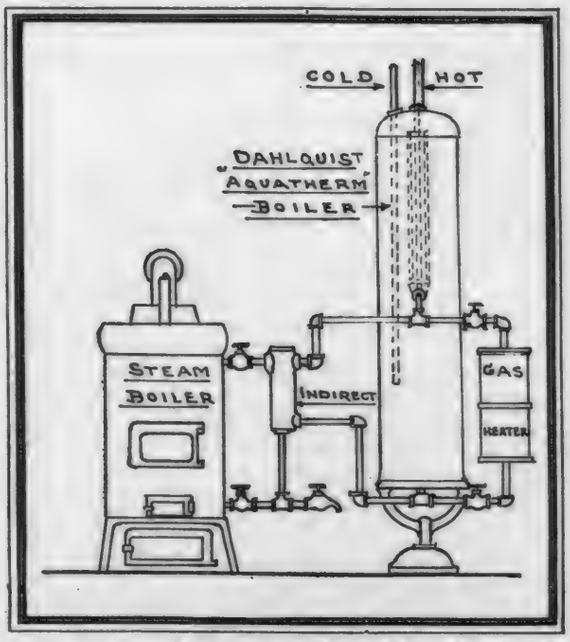
The **Dahlquist Aquatherm** can be furnished separately in proper size for any range boiler now installed.

When hot water is not drawn, the **Aquatherm** stores it in the range boiler. The action of the **Aquatherm** is entirely automatic.

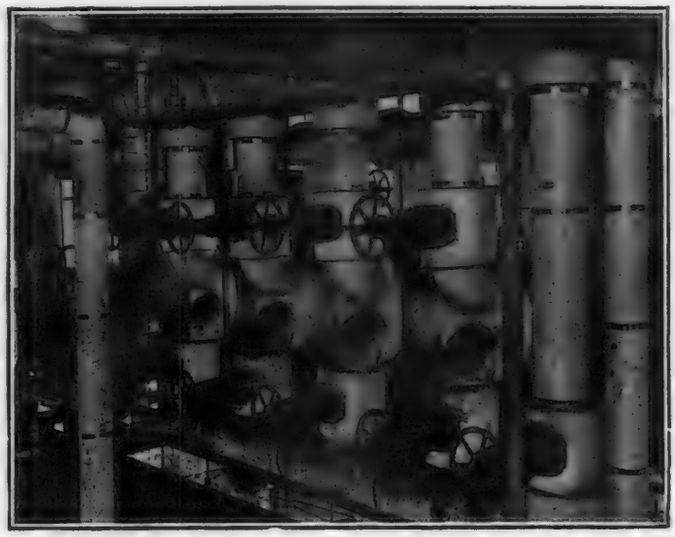
Let us send full details.

DAHLQUIST MFG. CO.

40 W. 3rd St. BOSTON, MASS.



Dahlquist Aquatherm Copper Range Boiler installed in cellar in connection with gas tank water heater and indirect water heater in cellar.



CONVERTORS
Hot Water Heating Systems

WHITLOCK Convertors are furnishing hot water for heating purposes in many large buildings and industrial plants. Using either live or exhaust steam efficiently they are suitable for any working conditions.

The five Type R convertors shown, installed at the plant of the Colt's Patent Fire Arms Mfg. Co., are capable of heating 134,000 gallons of water per hour from 180° to 200° F.

Whitlock Engineers are prepared to give estimates on Convertors for any specific problem in which you are interested—absolutely without obligation. Information and estimates will also be furnished on any other apparatus coming within the range of Whitlock Heat Transfer Products.

THE WHITLOCK COIL PIPE CO.

40 South Street **Hartford, Conn.**

New York Chicago Boston Buffalo Philadelphia San Francisco

and other Principal Cities—Consult your local Telephone Directory.

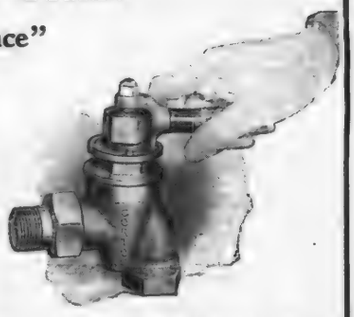
WHITLOCK HEAT TRANSFER PRODUCTS

Whitlock Heaters are manufactured in Canada by Darling Bros., Ltd., Montreal

GORTON VALVES

GET THIS!

"Worth the Difference"



"For the past few years we have been using your Quarter Turn Valve in increasing quantities and have found that they prove universally satisfactory.

We make a special effort to use them on the best of our Hot Water jobs because of the stuffing box feature. Naturally the cost of the work is higher when the Gorton Valves are installed, but both the Architect and the Owner, when shown a sample of the Valve, agree that it *is worth the difference.*

We are always glad to recommend Gorton Valves."

E. W. GIBBS,
* The Smith-Gibbs Co., 11 S. Main St., Providence, R. I.

We can promise you the same satisfactory experience

Gorton & Lidgerwood Co.

96 Liberty Street, New York, N. Y.

Established 1887 Representatives in Principal Cities

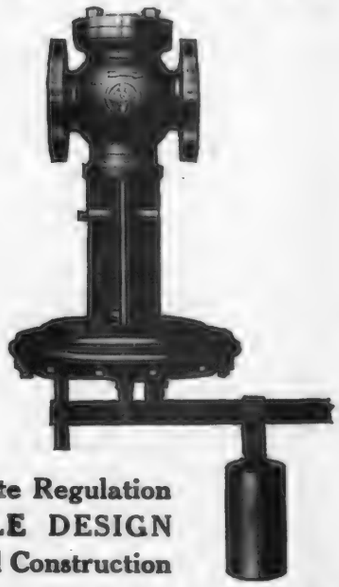
**Heating, Engineering and Contracting since 1870.*

USE A MASON

Lever Style Reducing Valve

on your next

HEATING CONTRACT



Accurate Regulation
SIMPLE DESIGN
Rugged Construction

MASON REGULATOR COMPANY

Boston, Mass. San Francisco, Cal. Montreal, Canada

Photograph of installation being made in Scottsbluff, Nebr.

ADSCO

Casing Makes Underground Steam Lines Highly Efficient

Adsco Red Diamond Brand Casing is thoroughly kiln-dried. When heat is turned on the line Adsco Casing never contracts, but retains its perfect insulation.

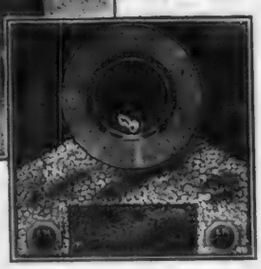
Wood is a non-conductor of heat—the firm shell of Adsco Casing plus the dead air space between the pipe and the casing assures maximum delivery at the terminus of the line.

It is light, can be easily handled, and quickly installed.

With the one operation of slipping the casing over the pipe you build the conduit and apply the insulation.

Hundreds of miles of underground steam lines are insulated with Adsco Casing—including miles of distribution lines for District Steam Heating Plants, steam lines between factory, office and other buildings of industrial plants, between garages and homes and scattered buildings of institutions heated from one boiler plant.

The high efficiency and long life of Adsco Red Diamond Brand Casing are reasons why it has been used nationally for the past forty-eight years.



Cross-section of standard underground steam main designed by the engineers of the American District Steam Co.

Send us sketch of your proposed underground line so we may present recommendation for your consideration.

AMERICAN DISTRICT STEAM COMPANY

GENERAL OFFICES AND WORKS

NORTH TONAWANDA, N.Y.

OFFICES: NEW YORK, CHICAGO, SEATTLE

ADSCO HEATING

AMERICAN DISTRICT STEAM COMPANY North Tonawanda, N. Y. H-7

Gentlemen:

Please give me without obligation specific information as to the most economical and scientific way in which to meet this particular heating problem.

.....

.....

Name.....

Address.....

Both Mean "Standard"

THE word "Sterling" stamped on silver means "Sterling Quality"—it is your protection against cheap silver substitutes. Like the word "Sterling," the name "Patterson" on Hot Water Heaters is your guarantee against inferior heaters.

Scientific design, highest grade materials, ultra-thorough workmanship and conscientious inspection are the steps by which Patterson Heaters won their reputation as the "Standard" make and by which they have maintained that reputation for more than 45 years.

When you specify the "Patterson" you are sure they will give all the hot water that can be used, as hot as desired and as quickly as it can be drawn. This we *guarantee.*

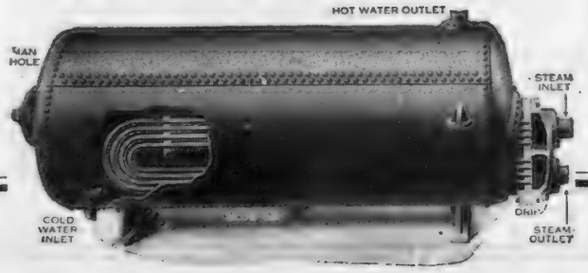
Write for catalog

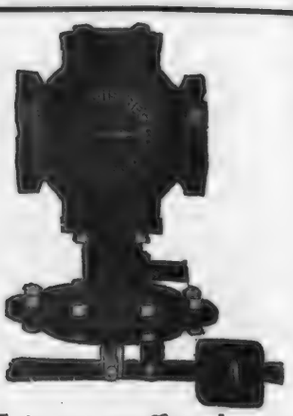
The Patterson-Kelley Co.

107 East Fortieth Street

New York, N. Y.

Patterson
Hot Water Heaters





THERE is no stuffing box on the Davis "P. & W." Pressure Regulator. The bronze bushing, used instead of a stuffing box, has an easy sliding fit. This eliminates sticking and excess friction which might be caused by screwing a stuffing box up too tight. This regulator is extremely sensitive—it works on a fraction of a pound pressure.

G. M. DAVIS REGULATOR CO.

436 Milwaukee Ave., Chicago, Illinois

1875—Valve makers for fifty years—1925

DAVIS VALVE
STEAM SAVERS SINCE 1875
SPECIALTIES

The STICKLE Thermostatic Radiator Valve

The Expansion principle in return line Radiator Traps is not novel or new. Consequently the difference in this class of Traps is in the construction.

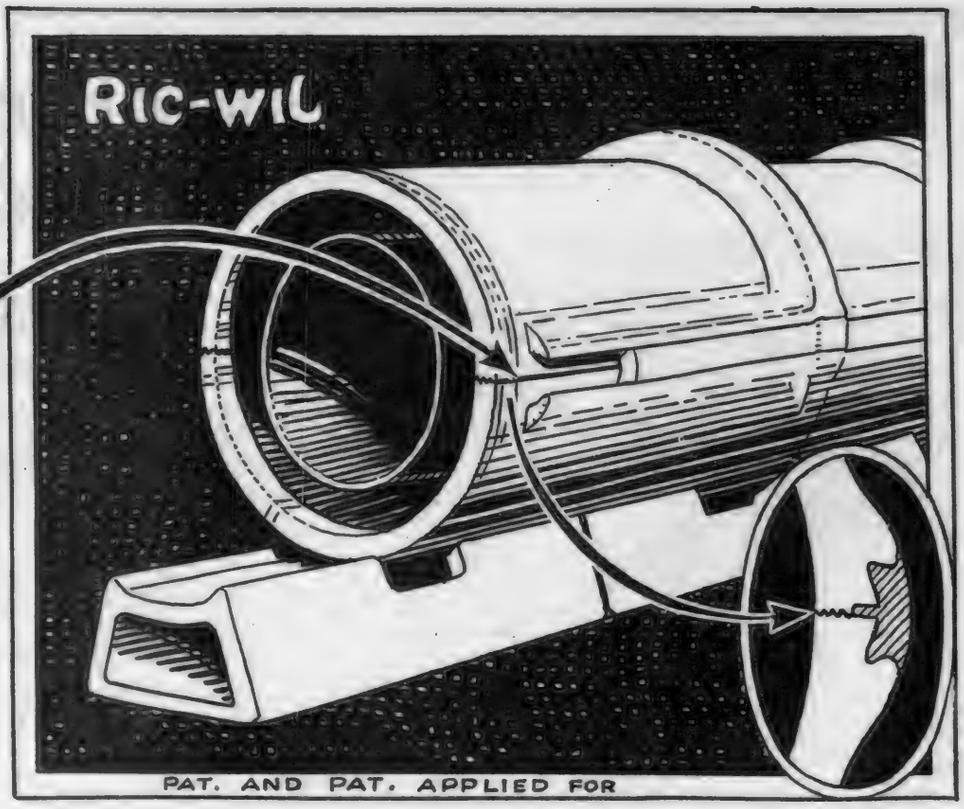
The expansive movement of this diaphragm is fully one-quarter inch, which is much more than is necessary for opening and closing the valve. This gives a factor of safety which is greater than any valve made, consequently it requires no adjustment. May we send you our bulletin?

STICKLE STEAM SPECIALTIES CO.

INDIANAPOLIS, IND.

New York Office
46 E. 41st St.

Boston Office
52 Sudbury St.



This is the Loc-liP Joint that water can't penetrate. Note how the fractured surfaces of the split tile form a perfect seat and are then locked together by a heavy bond of cement that is itself locked tightly in place. Tests have proved the Loc-liP waterproof and of extraordinary strength.

LOC-LIP Guarantees Dry Conduit

IF your underground conduit doesn't stay dry, you've lost the only advantage you expected to gain by installing it. For wet insulation steals heat instead of saving it. And wet insulation deteriorates rapidly.

But Ric-wiL is made to stay dry and **it stays dry.** With Ric-wiL Loc-liP keeping the conduit absolutely water-tight and Ric-wiL Base Drain, close under, carrying off outside water instantly, you are guaranteed an everlastingly dry conduit. Whatever insulation you use, it stays permanently at its peak of efficiency.

Specify Ric-wiL—for jobs that will never need to be done over

THE RIC-WIL COMPANY, Cleveland, Ohio

These Ric-wiL Advantages

Help to explain the rapidly growing number of straight Ric-wiL specifications by engineers.

Ric-wiL Base Drain
Large capacity and close under conduit. Great strength, won't break down and clog. Adds 35% to strength of conduit it carries. Extra easy to install.

External Pipe Supports
Heavy cast iron rust proofed roller supports which wedge quickly and solidly between sections of base drain and carry pipes independent of conduit.

Interlocking Design
Every part of Ric-wiL "interlox" into a compact rigid whole, base drain, pipe supports, conduit sections, conduit halves. Ric-wiL "stays put."

Water-Tight
The Loc-liP takes care of that.

Special Insulation
Four types of insulation to meet all needs. In two of them, insulation is moulded to the tile conduit.

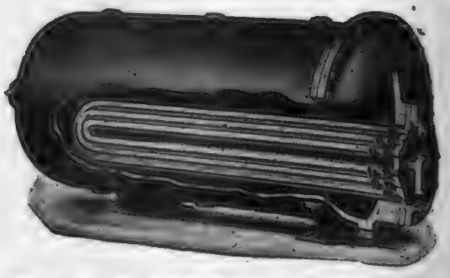
Low Installation Cost
Figures from plenty of actual jobs show the extraordinary low cost of installing Ric-wiL.

RIC WIL
UNDERGROUND CONDUIT

"Give 'Em Hot Water— Not Hot Air"

"You can't talk the tenants into a liking for cold water or the boss into an appreciation of steep coal bills. That's why I'm glad I'm running a **National** Storage Heater. There's never any kick on service, it sure goes easy on steam, and it's a cinch to take care of."

Write for Bulletin 65.



NATIONAL
U BEND TYPE
STORAGE HEATERS

The National Pipe Bending Company

120 RIVER STREET *Established 1883* NEW HAVEN, CONN.

Canadian Representative: Grant E. Cole Company, Toronto, Ont. 8524

"Stay-Rite" Line

No. 2—Radiator Trap

IDEAL Stay-Rite Radiator Traps are made in both liquid diaphragm and all-metal types. They are the most rugged traps obtainable, and cannot rupture under any conditions.

They have no equal on vacuum pump installations and where dependable and permanent trap efficiency is required. Short circuiting is absolutely overcome by their use.

Stay-Rite Traps are simple and rugged in construction, powerful and efficient in operation.

Let us quote you on Stay-Rite Specialties

The Ideal Heating Equipment Co.

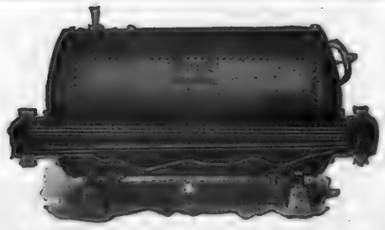
1250 West 4th Street CLEVELAND, OHIO

HEATING Stanwood Smokeless Boilers POWER

HEATING CAPACITY
Steam—3300 Sq. Ft. to 25,000 Sq. Ft.
Water—5200 Sq. Ft. to 40,000 Sq. Ft.

NO MUD LEGS OR STAYBOLTS
LOW STACK TEMPERATURES
LOW WATER LEVEL—RAPID CIRCULATION

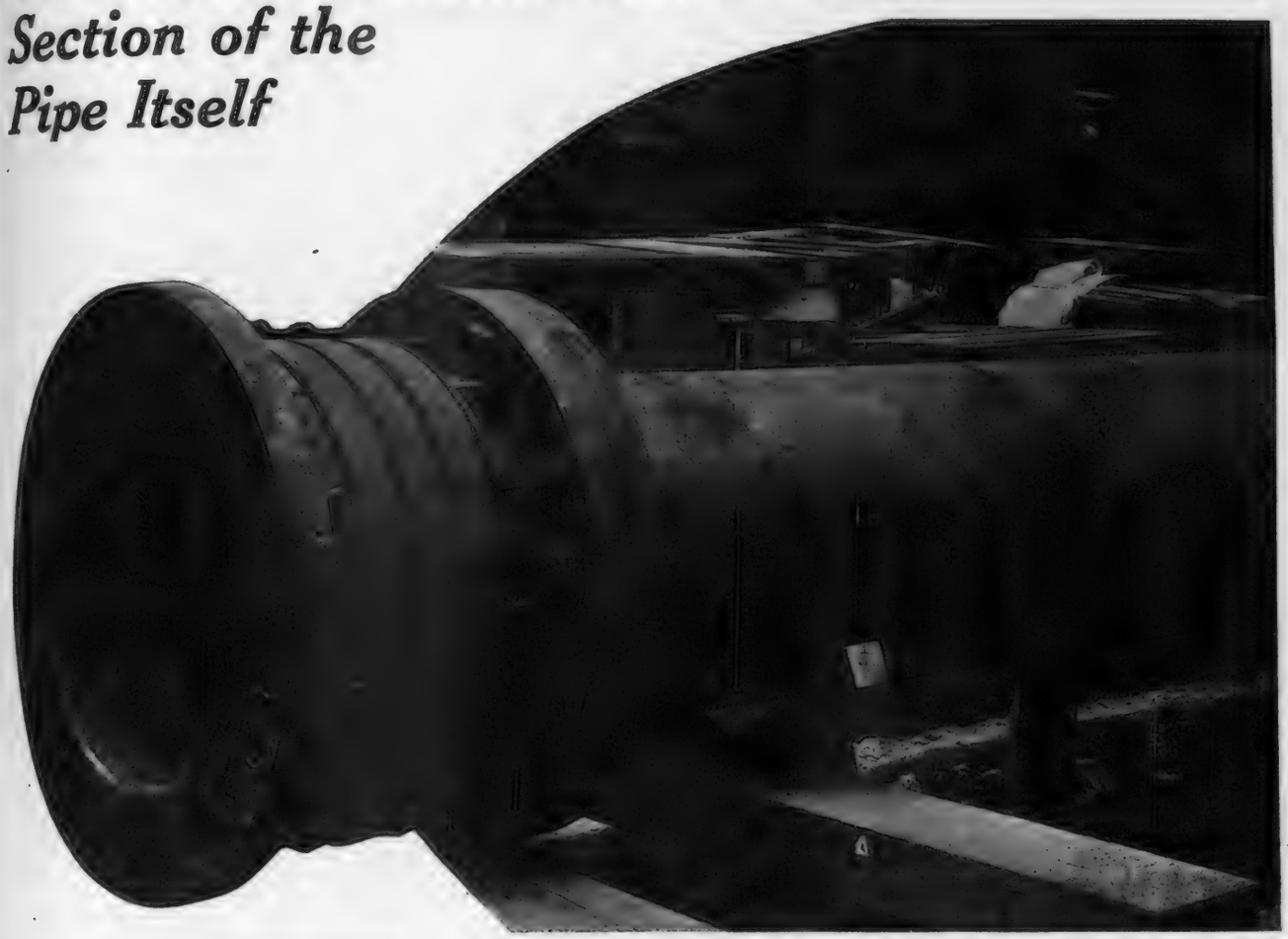
The Stanwood Corporation
CINCINNATI, OHIO
Successor to
THE HOUSTON STANWOOD & GAMBLE CO.



Alberger-Buffalo Storage Heaters have tubes the full length of tank which insures maximum heat transfer. Satisfaction guaranteed. Write for information on Alberger Multi Head Heaters and Howard Guided Expansion Joints.

ALBERGER HEATER COMPANY
HOWARD IRON WORKS
281-289 Chicago St. Buffalo, N. Y.

A Corrugated Copper Expansion Joint that can be Installed like a small Section of the Pipe Itself



Service

To complete the cycle of Badger efficiency we offer, without obligation, the services of our Engineering Department in selecting the right joint for each Badger installation. This service is based on eighty-three years' experience in the manufacture of metal specialties.

BESIDES embodying all the requirements demanded of an expansion joint, the Badger Self-Equalizing Expansion Joint boasts of many distinct advantages.

Among these features are its compactness and ease of installation. The above illustration shows a Badger Self-Equalizing Expansion Joint ready for installation in one of the biggest high pressure steam jobs in New York City. Note that this expansion joint requires no more space than the pipe itself and that the installation necessitates merely the bolting in place like a small section of the pipe itself.

Before recommending your next expansion joints, let our engineers explain Badger advantages—one piece, no packing or adjusting, equal expansion, elimination of leaks, ease of installation, proper depth of corrugations, and many other.

E.B. BADGER & SONS COMPANY

75 PITTS STREET, BOSTON, U.S.A.

Branch Offices in principal Cities

ESTABLISHED 1841 · WEATHER VANE ON FANEUIL HALL · E.B. BADGER & SONS COMPANY · TRADE MARK

BADGER QUALITY

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Powers Regulator Co., Chicago, Ill.

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Atmospheric Conditioning Corporation, Philadelphia, Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Carrier Air Conditioning Co., of America, Buffalo, N. Y.
Carrier Engineering Corporation, Newark, N.J.
Clarage Fan Co., Kalamazoo, Mich.
Fleisher Co., Inc., W. L. New York.
Grinnell Company, Providence, R. I.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
Midwest Air Filters, Inc., New York.
New York Blower Co., Chicago, Ill.
Reed Air Filter Co., Inc., Louisville, Ky.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.

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Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corporation, Newark, N.J.
Clarage Fan Co., Kalamazoo, Mich.
Cooling Tower Co., New York.
Fleisher Co., Inc., W. L., New York
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Badger & Sons Co., E. B., Boston, Mass.
Bayley Mfg. Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Cooling Tower Co., Inc., New York.
Fleisher Co., Inc., W. L. New York.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Reed Air Filter Co., Inc., Louisville, Ky.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Mass.

BLOWERS

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Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.
York Heating & Ventilating Co., Philadelphia, Pa.

Pressure.

American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.

Rotary.

Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

Turbine.

Sturtevant Co., B. F., Hyde Park, Mass.
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Hart and Crouse, Utica, N. Y.
Illinois Malleable Iron Co., Chicago, Ill.
Kewanee Boiler Co., Kewanee, Ill.
Oil City Boiler Works, Oil City, Pa.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Co., New York.
Stanwood Corporation, Cincinnati, Ohio.
Universal Smokeless Boiler Co., Ravenna, O.

Heating.

American Radiator Co., Chicago, Ill.
Brownell Co., The, Dayton, O.
Bryant Heater & Mfg. Co., Cleveland, Ohio.
Burnham Boiler Corp., Irvington, N. Y.
Continental Heater Corp., Dunkirk, N. Y.
Cox Stove Co., Abram, Philadelphia, Pa.
Frost Mfg. Co., Chicago, Ill.
General Boilers Co., Waukegan, Ill.
Gorton & Lidgerwood Co., New York.
Grinnell Company, Providence, R. I.
Gurney Heater Mfg. Co., Boston, Mass.
Handon Boiler Corp., New York.
Heggie Simplex Boiler Co., Joliet, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
International Heater Co., Utica, N. Y.
Kewanee Boiler Co., Kewanee, Ill.
Niagara Radiator & Boiler Co., North Tonawanda, N. Y.
Oil City Boiler Works, Oil City, Pa.
Page Boiler Co., Wm. H., New York
Pierce, Butler & Pierce Mfg. Co., New York.
Stanwood Corporation, Cincinnati, Ohio.
Thatcher Co., Newark, N. J.
Titusville Iron Works, Titusville, Pa.
Universal Smokeless Boiler Co., Ravenna, O.
Utica Heater Co., Utica, N. Y.
Weil-McLain Co., Chicago, Ill.

Power.

Frost Mfg. Co., Chicago, Ill.
Heggie Simplex Boiler Co., Joliet, Ill.
Kewanee Boiler Co., Kewanee, Ill.
Oil City Boiler Works, Oil City, Pa.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., Titusville, Pa.

CALORIMETERS.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Sarco Co., New York.

COILS, PIPE.

American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Griscom-Russell Co., New York.
National Pipe Bending Co., New Haven, Conn.
Whitlock Coil Pipe Co., Hartford, Conn.

Air.

New York Blower Co., Chicago, Ill.

CONDENSERS.

Alberger Heater Co., Buffalo, N. Y.
American Radiator Co., Chicago, Ill.
American Steam Pump Co., Battle Creek, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Elliott Co., Jeanette, Pa.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Whitlock Coil Pipe Co., Hartford, Conn.

CONVERTERS, HOT WATER.

Alberger Heater Co., Buffalo, N. Y.
Griscom-Russell Co., New York.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co. Inc., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.
Wyckoff & Son Co., A., Elmira, N. Y.

COOLERS.

Oil.

Alberger Heater Co., Buffalo, N. Y.
Griscom-Russell Co., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.

COOLING TOWERS.

Badger & Sons Co., E. B., Boston, Mass.
Cooling Tower Co., New York.
Spray Engineering Co., Boston, Mass.

COPPER BOILERS.

Dahlquist Mfg. Co., Boston, Mass.

COPPER KETTLES.

Dahlquist Mfg. Co., Boston, Mass.

COVERING PIPE.

American District Steam Co., No. Tonawanda, N. Y.
Hornung, J. C., Chicago, Ill.
Johns-Manville Inc., New York.
Ric-Wil Co., Cleveland, O.
Wyckoff & Son Co., A, Elmira, N. Y.

DAMPERS, DUCT.

American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, O.
York Heating & Ventilating Co., Philadelphia, Pa.

DEHUMIDIFYING APPARATUS.

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila., Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Engineering Corp., Newark, N. J.
Cooling Tower Co., New York.
Fleisher Co., Inc., W. L., New York.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

DISTILLERS, (Water).

Badger & Sons Co., E. B., Boston, Mass.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co. Inc., Buffalo, N. Y.

DRAFT APPLIANCES.

Crown Fuel Saver Co., Richmond, Ind.
Wolff Coal Saver Co., Chicago, Ill.

DRYING SYSTEMS.

(See Air Cooling and Drying Systems.)

DUST COLLECTING SYSTEMS.

American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, New York.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
York Heating & Ventilating Co., Philadelphia, Pa.

DUST COLLECTORS.

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila., Pa.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Co., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F. Hyde Park, Mass.
York Heating & Ventilating Co., Philadelphia, Pa.

DUST DETERMINATORS.

Atmospheric Conditioning Corp., Phila., Pa.

ENGINES.

Steam, Automatic.

American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, O.
Clarage Fan Co., Kalamazoo, Mich.
New York Blower Co., Chicago, Ill.
Stanwood Corporation, Cincinnati, Ohio.
Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

Steam, High Speed.

American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, O.
Clarage Fan Co., Kalamazoo, Mich.
New York Blower Co., Chicago, Ill.
Pierce, Butler & Pierce Mfg. Co., New York.
Sturtevant Co., B. F., Hyde Park, Mass.

EQUALIZING LOOPS.

Hoffman Specialty Co., New York.

EVAPORATORS.

Boiler Feed Make-Up.

Badger & Sons Co., E. B., Boston, Mass.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.

EXHAUST HEADS.

Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
Wright-Austin Co., Detroit, Mich.

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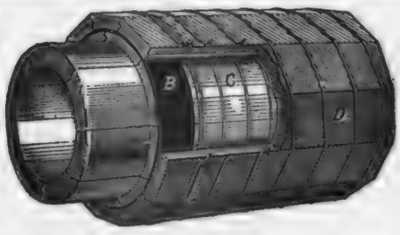

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1421 Dayton St., Chicago

ENGINEERS' SPECIFICATION INDEX (Continued)

EXHAUST SYSTEMS.

American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Ilg Electric Ventilating Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Co., Philadelphia, Pa.

EXPANSION JOINTS.

American District Steam Co., No. Tonawanda, N. Y.
Badger & Sons Co., E. B., Boston, Mass.
Central Station Steam Co., Detroit, Mich.
Dahlquist Mfg. Co., Boston, Mass.
Griscom-Russell Co., New York.
Hornung, J. C., Chicago, Ill.
Howard Iron Works, Buffalo, N. Y.
Illinois Engineering Co., Chicago, Ill.
Ric-Wil Co., Cleveland, O.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Webster & Co., Warren, Camden, N. J.
Wheeler Condenser & Engineering Co., Carteret, N. J.

EXPANSION SHELLS

Phillips Drill Co., Chicago, Ill.

FANS, EXHAUST.

Amercan Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Seymour, James M., Newark, N. J.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
L. J. Wing Mfg. Co., New York.
York Heating & Ventilating Co., Philadelphia, Pa.

FEEDERS

Boiler

Kieley & Mueller, Inc., New York.
McDonnell & Miller, Chicago, Ill.

FILTERS, (Aerating).

Griscom-Russell Co., New York.

Feed-Water.

Elliot Co., Jeanette, Pa.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.

FITTINGS

Groeinger Mfg. Co., Columbus, Ohio.

FITTINGS, FLANGED.

American District Steam Co., No. Tonawanda, N. Y.
Clow and Sons, Jas. B., Chicago, Ill.
Grinnell Company, Providence, R. I.

FLANGES.

American District Steam Co., No. Tonawanda, N. Y.
Jenkins Bros., New York.

GAS BURNERS

Cleveland Gas Burner & Appliance Co., Cleveland, Ohio.
Franklin Gas Burner Mfg. Co., Cincinnati, O.

GASKETS, METALLIC.

Sarco Co., New York.

GAUGE BOARDS.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Co., Cleveland, Ohio.
Bristol Co., Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Webster & Co., Warren, Camden, N. J.

GAUGES.

Altitude.

Pierce, Butler & Pierce Corp., New York.

Draft.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

Hydraulic.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

Ounce Graduated.

Marsh & Co., Jas. P., Chicago, Ill.
O-E Specialty Co., Milwaukee, Wis.

Pressure.

American Dist. Steam Co., North Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Webster & Co., Warren, Camden, N. J.
Bishop & Babcock Co., Cleveland, Ohio.

Vacuum.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Webster & Co., Warren, Camden, N. J.

Vacuum (Compound).

Cashin Co., W. D., Boston, Mass.
Pierce, Butler & Pierce Corp., New York.

Water.

American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenburg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Bristol Co., Waterbury, Conn.
Jenkins Bros., New York.

GENERATOR COOLING SYSTEMS.

Atmospheric Conditioning Corp., Phila., Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Air Conditioning Co., of America, Buffalo, N. Y.
Cooling Tower Co., New York.
Sturtevant Co., B. F., Hyde Park, Mass.

GOVERNORS, (Pump).

Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Stickle Steam Specialties Co., Indianapolis, Ind.
Westinghouse Elec. &. Mfg. Co., East Pittsburgh, Pa.
Wright-Austin Co., Detroit, Mich.

GRATES

Dumping

Pyramid Iron Products Co., New York.

Rocking

Pyramid Iron Products Co., New York.

Shaking

Pyramid Iron Products Co., New York.

Shaking and Dumping

Pyramid Iron Products Co., New York.

Shaking, Circular

Pyramid Iron Products Co., New York.

Stationary

Pyramid Iron Products Co., New York.

HEATERS.

Domestic Water.

Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., No. Tonawanda, N. Y.
American Radiator Co., Chicago, Ill.
Bryant Heater & Mfg. Co., Cleveland, Ohio.
Burnham Boiler Corp., Irvington, N. Y.
Dahlquist Mfg. Co., Boston, Mass.
Everhot Heater Co., Detroit, Mich.
Excelso Specialty Works, Buffalo, N. Y.
National Pipe Bending Co., New Haven, Conn.
Page Boiler Co., Wm. H., New York.
Patterson-Kelley Co., New York.
Pierce, Butler & Pierce Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sims Co., Erie, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

Electrical Unit

Ilg Electric Ventilating Co., Chicago, Ill.

Feed Water, (Closed).

Alberger Heater Co., Buffalo, N. Y.
Griscom-Russell Co., New York.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sims Co., Erie, Pa.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Whitlock Coil Pipe Co., Hartford, Conn.

Feed Water, (Open).

Griscom-Russell Co., New York.
Sims Co., Erie, Pa.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.

Fuel-oil.

Alberger Heater Co., Buffalo, N. Y.
American Blower Co., Detroit, Mich.
Griscom-Russell Co., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Inc., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.

Air, Fan System.

Aerofin Corporation, Newark, N. J.
American Blower Co., Detroit, Mich.
American Radiator Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

Portable Unit Air.

American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Buffalo Forge Co., Buffalo, N. Y.
Dwyer Equipment Co., Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill.
Pecco Incorporated, St. Louis, Mo.
Skinner Bros. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
Supreme Heater & Ventilating Corp., St. Louis, Mo.
L. J. Wing Mfg. Co., New York.
York Heating & Ventilating Co., Philadelphia, Pa.
(See also Ventilators, Portable Unit.)

HEATING SYSTEMS.

"Gasteam".

James B. Clow & Sons, Chicago, Ill.

Vacuum.

Barnes & Jones, Boston, Mass.
Bishop & Babcock Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
O-E Specialty Co., Milwaukee, Wis.
Sarco Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.

Vapor.

American District Steam Co., No. Tonawanda, N. Y.
Barnes & Jones, Boston, Mass.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Gorton & Lidgerwood Co., New York.
Grinnell Company, Providence, R. I.
Haines & Co., Wm. S., Philadelphia, Pa.
Ideal Heating Equip. Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Klipfel Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mouat Vapor Heating Co., Cleveland, O.
H. W. Nelson Co., Moline, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane & Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.

Water.

Grinnell Company, Providence, R. I.
Thrush & Co., H. A., Peru, Ind.

HUMIDIFIERS

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila., Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Air Conditioning Co., of America, Buffalo, N. Y.
Carrier Engineering Corporation, Newark, N. J.
Grinnell Company, Providence, R. I.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Seymour, James M., Newark, N. J.
Sturtevant Co., B. F., Hyde Park, Mass.

HUMIDITY CONTROL.

American Blower Co., Detroit, Mich.
Atlas Valve Co., Newark, N. J.
Atmospheric Conditioning Corp., Phila, Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Air Conditioning Co., of America, Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Foxboro Co., Inc., The Foxboro, Mass.
Grinnell Company, Providence, R. I.
Klipfel Mfg. Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

INSTRUMENTS

Electric Measuring.

Bristol Co., Waterbury, Conn.
Westinghouse Electric & Mfg. Co., East Pittsburg, Pa.

Indicating and Recording.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Bailey Meter Co., Cleveland, O.
Foxboro Co., Inc., The Foxboro, Mass.

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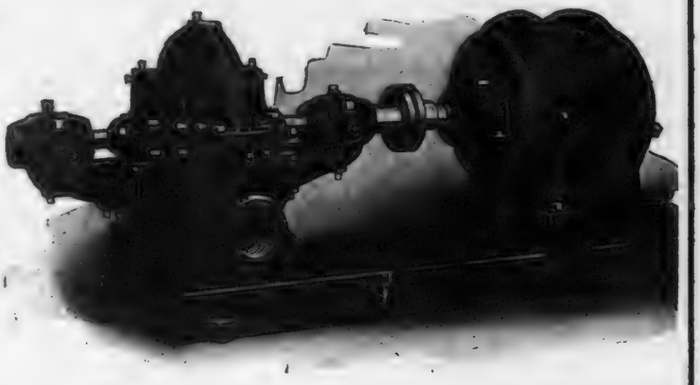

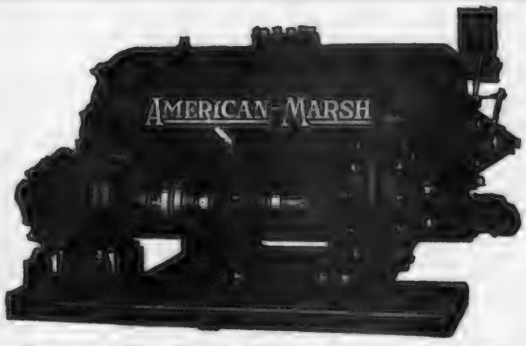

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- Sump or Bilge Pumps
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- Automatic Boiler Feed Pumps and Receivers

Write for Bulletins

AMERICAN STEAM PUMP COMPANY

BATTLE CREEK, MICHIGAN

ENGINEERS' SPECIFICATION INDEX (Continued)

Marsh & Co., Jas. P., Chicago, Ill.
Sarco Co., New York
Westinghouse Elec. & Mfg. Co., East Pittsburg, Pa

INSULATING MATERIALS.

American District Steam Co., No. Tonawanda, N. Y.
Armstrong Cork & Insulation Co., Pittsburgh, Pa.
Hornung, J. C., Chicago, Ill.
Johns-Manville, Inc., New York.
Ric-Wil Co., Cleveland, O.
Union Fibre Co., Winona, Minn.
Wyckoff & Sons, A., Elmira, N. Y.

MANOMETERS.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.

MECHANICAL DRAFT APPARATUS.

American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, O.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park Mass.
L. J. Wing Co., New York.

METERS.

Condensation.

American Dist. Steam Co., No. Tonawanda, N. Y.
Central Station Steam Co., Detroit, Mich.
Hornung, J. C., Chicago, Ill.

Feed Water.

Central Station Steam Co., Detroit, Mich.

Feed Water (Wier Type).

Webster & Co., Warren, Camden, N. J.

Flow

American District Steam Co., North Tonawanda, N. Y.
Spray Engineering Co., Boston, Mass.

Pitot Tube.

American Blower Co., Detroit, Mich.

Steam.

American District Steam Co., No. Tonawanda, N. Y.
Foxboro Co., Inc., The Foxboro, Mass.

MOTORS (Electric).

Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

NOZZLES, SPRAY

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Co., Phila., Pa.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Manufacturing Co., Milwaukee, Wis.
Carrier Air Conditioning Co. of America, Buffalo, N. Y.
Carrier Engineering Co., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
New York Blower Co., Chicago, Ill.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Mass.

OIL BURNING EQUIPMENT

Heat Equipment Corp., Lincoln, Neb.
Johnson Co., S. T., Oakland, Cal.

OZONE APPARATUS.

United States Ozone Co., Scottdale, Pa.

PIPE.

Cast Iron.

Clow & Sons, Jas. B., Chicago, Ill.

Steel.

National Tube Co., Pittsburgh, Pa.

Wood.

Wyckoff & Sons Co., A., Elmira, N. Y.

PIPE BENDING.

Badger & Sons Co., E. B., Boston, Mass.
Buffalo Forge Co., Buffalo, N. Y.
Grinnell Company, Providence, R. I.
National Pipe Bending Co., New Haven, Conn.
Whitlock Coil Pipe Co., Hartford, Conn.

PIPE CASING (Wood).

American District Steam Co., No. Tonawanda, N. Y.
Wyckoff & Sons Co., A., Elmira, N. Y.

PIPE HANGERS.

Grinnell Company, Providence, R. I.
Jenkins Bros., New York.

PIPE, POWER.

Grinnell Company, Providence, R. I.

PUMPS.

Centrifugal.

American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Yeomans Bros. Co., Chicago, Ill.
Young Pump Co., Michigan City, Ind.

Condensation.

American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Wright-Austin Co., Detroit, Mich.
Yeomans Bros. Co., Chicago, Ill.
Wright-Austin Co., Detroit, Mich.
Yeomans Bros. Co., Chicago, Ill.

Rotary.

Nash Engineering Co., So. Norwalk, Conn.

Steam.

American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Nash Engineering Co., So. Norwalk, Conn.

Turbine.

Nash Engineering Co., So. Norwalk, Conn.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Yoemans Bros., Chicago, Ill.

Vacuum.

American Steam Pump Co., Battle Creek, Mich.
Bishop & Babcock Co., Cleveland, Ohio.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Elliott Co., Jeannette, Pa.
McAlear Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
Skidmore Corp., Chicago, Ill.
Trane Co., La Crosse, Wis.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Yeomans Bros., Chicago, Ill.
Young Pump Co., Michigan City, Ind.

RADIATOR BUSHINGS.

Metering.

Holley Mfg. Co., Virginia, Minn.

RADIATOR HANGERS.

Gloeckle, Jr., A. F., Rochester, N. Y.
Grinnell Company, Providence, R. I.
Healy-Ruff Co., Minneapolis, Minn.
Pierce, Butler & Pierce Mfg. Co., New York.

RADIATORS.

"Gasteam."

James B. Clow & Sons, Chicago, Ill.

"Gaswater."

Clow & Sons, Jas. B., Chicago, Ill.

RADIATORS, STEAM AND WATER.

Aerofin Corp., Newark, N. J.
American Radiator Co., Chicago, Ill.
International Heater Co., Utica, N. Y.
Gurney Heater Mfg. Co., Boston, Mass.
Lyon Products Co., Chicago, Ill.
Pierce, Butler & Pierce Mfg. Co., New York.

RECEIVERS.

Air.

American District Steam Co., No. Tonawanda, N. Y.
The Brownell Co., Dayton, Ohio.
Kieley & Mueller, Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.

Condensation.

Chicago Pump Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Yeomans Bros., Chicago, Ill.

REGULATORS.

Boiler-Feed.

Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Stickle Steam Specialties Co., Indianapolis, Ind.
Thrush & Co., H. A., Peru, Ind.
Wright-Austin Co., Detroit, Mich.

Damper.

American Dist. Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
American Radiator Co., Chicago, Ill.
Bishop & Babcock Co., Cleveland, Ohio.
Davis Regulator Co., G. M., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
National Regulator Co., Chicago, Ill.
Nelson Co., H. W., Moline, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Simplex Heating Specialty Co., Inc., Lynchburgh, Va.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Thrush & Co., H. A., Peru, Ind.
Trane Co., La Crosse, Wis.
L. J. Wing Mfg. Co., New York.

Pressure.

American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Foxboro Co., Inc., The Foxboro, Mass.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Minneapolis Heat Regulator Co., Minneapolis, Minn.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Stickle Steam Specialties Co., Indiapapolis, Ind.
Thrush & Co., H. A., Peru, Ind.

Temperature.

American Radiator Co., Chicago, Ill.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Co., Cleveland, Ohio.
Carrier Engineering Corporation, Newark, N. J.
Elliott Co., Jeannette, Pa.
Foxboro Co., Inc., The Foxboro, Mass.
Fulton Co., Knoxville, Tenn.
Gold Car Heating & Lighting Co., Brooklyn,
Hornung, J. C., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Minneapolis Heat Regulator Co., Minneapolis, Minn.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., New York.

SEPARATORS.

Oil.

Elliott Co., Jeannette, Pa.
Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Stickle Steam Specialties Co., Indianapolis, Ind.
Wright-Austin Co., Detroit, Mich.

Steam.

American District Steam Co., No. Tonawanda, N. Y.
Bishop & Babcock Co., Cleveland, Ohio.
Elliott Co., Jeannette, Pa.
Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Sims Co., Erie, Pa.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

SPRAY COOLING SYSTEMS.

Atmospheric Conditioning Corp., Phila., Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Cooling Tower Co., New York.
Massachusetts Blower Co., Watertown, Mass.
Seymour, James M., Newark, N. J.

SPRAY NOZZLES

(See Nozzles, Spray)

SPRINKLER HEADS

C. S. B. Sprinkler Co., Boston, Mass.

STRAINERS.

Oil.

Elliott Co., Jeannette, Pa.
Griscom-Russell Co., New York.
Kieley & Mueller, Inc., New York.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.

Pipe

Spray Engineering Co., Boston, Mass.

Steam.

American Dist. Steam Co., No. Tonawanda, N. Y.
Dunham Co., C. A., Chicago, Ill.
Eliott Co., Jeannette, Pa.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Mason Regular Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., New York.
Sterling Engineering Co, Milwaukee, Wis.
Wright-Austin Co., Detroit, Mich.

Water.

American Dist. Steam Co., No. Tonawanda, N. Y.
Davis Regulator Co., G. M., Chicago, Ill.
Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
Sarco Co., New York.
Spray Engineering Co., Boston, Mass.

THERMOMETERS.

(Recording and Indicating).

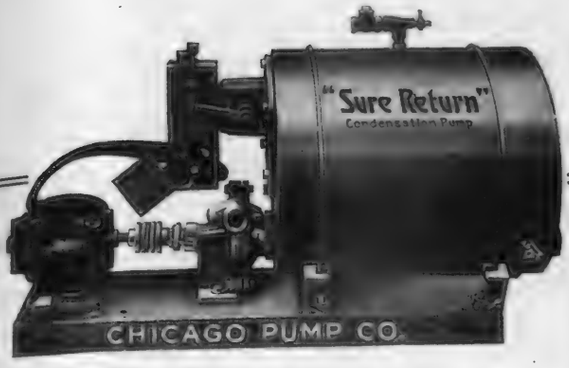
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Foxboro Co., Inc., The Foxboro, Mass.
Powers Regulator Co., Chicago, Ill.
Sarco Co., New York.

Water.

Marsh & Co., Jas. P., Chicago, Ill.
Pierce, Butler & Pierce Corp., New York.

THERMOSTATS.

American Radiator Co., Chicago, Ill.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Co., Cleveland, Ohio.
Fulton Co., Knoxville, Tenn.
Gold Car Heating & Lighting Co., Brooklyn,
Johnson Service Co., Milwaukee, Wis.
Klipfel Mfg. Co., Chicago, Ill.
Minneapolis Heat Regulator Co., Minneapolis, Minn.
Powers Regulator Co., Chicago, Ill.



Why a Chicago?

—because our long experience in every conceivable type of pumping problem requiring judgment, skill and science, both practical and technical, enables us to offer valuable suggestions to you.

—because our ever increasing list of successful installations throughout the country in such buildings as the S. W. Straus Building, Chicago, Ill., Citizens National Bank, Baltimore, Md., The Coliseum, Los Angeles, Cal., and many others of equal prominence show that engineers recognize the fact that they can depend upon a "Chicago" to do its work faithfully in any capacity.

—because our superior grade of workmanship and materials, prompt attention and faultless service to every client merits your confidence in our ability to serve you.

—because the prices are right.

The above illustration shows the "Sure Return" condensation pump and receiver designed to return condensate from heating coils, to the boiler. The "Sure Return" is made for pressure of 10 pounds at the pump and for capacities up to 10,000 square feet direct radiation. In addition to the "Sure Return," we manufacture a complete line of horizontal and vertical condensation pumps for pressure ranging from 10 to 200 pounds and in capacities from 3000 to 100,000 square feet direct radiation. Bulletin 57 fully describes this line.

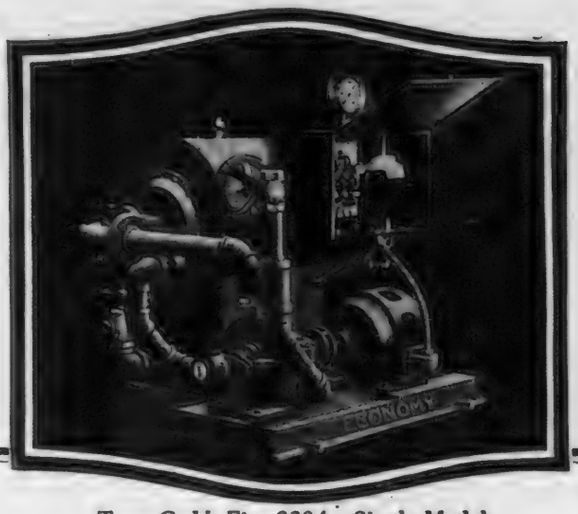
Chicago Pump Company

Manufacturers of quality centrifugal pumps for every service

Office and Works

2325 Wolfram St., Chicago, Ill., U. S. A.

Representatives in principal cities in U. S. and foreign countries



Type C. V. Fig. 2234—Single Model Vacuum Pumps

DEPENDABILITY

This is an essential requirement of all apparatus entering into the equipment of every worth while project.

Economy Centrifugal Vacuum Pumps

embody every requisite of high class equipment. They are well motored with ample reserve power. They never burn out, consequently shut downs are avoided.

They have ample air, water and pressure capacity.

They have longer life than other types.

They maintain their efficiencies.

They are scientifically designed.

They have the best thought of competent hydraulic and heating engineers built into them.

They require less attention and upkeep than other types.

They reduce noise in radiators and piping.

They operate quietly.

They use no more power than other pumps that do the same work.

They are guaranteed for performance and quality.

Representatives in Every Large City

Economy Pumping Machinery Co.

71-122 North Curtis St. CHICAGO

ENGINEERS' SPECIFICATION INDEX (Continued)

Sarco Co., New York.
Thrush & Co., H. A., Peru, Ind.

TRAPS.

Radiator.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Co., Cleveland, Ohio.
Cashin Co., W. D. Boston, Mass.
Dunham, C. A., Co., Chicago, Ill.
Hoffman Specialty Co., New York.
Ideal Heating Equipment Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
Johns-Manville, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Mouat Vapor Heating Co., Cleveland, O.
H. W. Nelson Co., Moline, Ill.
O-E Specialty Co., Milwaukee, Wis.
Sarco Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Trane Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.

Return.
American Blower Co., Detroit, Mich.
Barnes & Jones, Boston, Mass.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago Ill.
Johns-Manville, Inc., New York.
Kieley & Mueller, Inc., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mouat Vapor Heating Co., Cleveland, O.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Simplex Heating Specialty Co., Inc., Lynchburgh, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

Steam.
American Blower Co., Detroit, Mich.
American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Barnes & Jones, Boston, Mass.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Elliott Co., Jeannette, Pa.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johns-Manville, Inc., New York.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Sarco Co., New York.
Stickle Steam Specialties Co., Indianapolis, Ind.
Trane Co., La Crosse, Wis.
Wright-Austin Co., Detroit, Mich.

Vacuum.
American Blower Co., Detroit, Mich.
Bishop & Babcock Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

TURBINES (Steam).

Buffalo Forge Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co. East Pittsburgh, Pa.
L. J. Wing Mfg. Co., New York.

TURBO-BLOWERS.

Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

UNDERGROUND PIPE CONDUITS.

American District Steam Co., No. Tonawanda, N. Y.
Hornung, P. C., Chicago, Ill.
Johns-Manville, Inc., New York.
Ric-Wil Co., Cleveland, O.
Wyckoff & Son, A., Elmira, N. Y.

VACUUM CLEANING APPARATUS.

American Radiator Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

VALVES.

Air (Automatic).
American Radiator Co., Chicago, Ill.
Commonwealth Brass Corporation, Detroit, Mich.
Fulton Co., Knoxville, Tenn.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Jenkins Bros., New York.
Klipfel Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Pierce, Butler & Pierce Corp., New York.

Air Relief.
American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Barnes & Jones, Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Fulton Co., Knoxville, Tenn.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Co., Milwaukee, Wis.
Powell Co., Wm., Cincinnati, O.
Scott Valve Mfg. Co., Detroit, Mich.
Sterling Engineering Co., Milwaukee, Wis.
Webster & Co., Warren, Camden, N. J.

Back Pressure.
Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Scott Valve Mfg. Co., Detroit, Mich.
Stickle Steam Specialties Co., Indianapolis, Ind.

Balanced.
American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Scott Valve Mfg. Co., Detroit, Mich.
Stickle Steam Specialties Co., Indianapolis, Ind.

Blow-off.
Elliott Co., Jeannette, Pa.
Jenkins Bros., New York.
The Wm. Powell Co., Cincinnati, O.

Check.
Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Powell Co., Wm., Cincinnati, O.
Scott Valve Mfg. Co., Detroit, Mich.

Float.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Grinnell Company, Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller Co., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Stickle Steam Specialties Co., Indianapolis, Ind.

Gate.
American District Steam Co., No. Tonawanda, N. Y.
Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Erie, Pa.
Milwaukee Valve Co., Milwaukee, Wis.
Powell Co., Wm., Cincinnati, O.
Scott Valve Mfg. Co., Detroit, Mich.

Globe, Angle and Cross.
Commonwealth Brass Corp., Detroit, Mich.
Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Erie, Pa.
Milwaukee Valve Co., Milwaukee, Wis.
Pierce, Butler & Pierce Corp., New York.
Powell Co., Wm., Cincinnati, O.
Powers Regulator Co., Chicago, Ill.
Scott Valve Mfg. Co., Detroit, Mich.

Hydraulic-Operating.
Atlas Valve Co., Newark, N. J.
Kieley & Mueller, Inc., New York.
Klippel Mfg. Co., Chicago, Ill.

Non-Return.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Davis Regulator Co., G. M., Chicago, Ill.
Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Powell Co., Wm., Cincinnati, O.

Radiator.
American Radiator Co., Chicago, Ill.
American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Co., Cleveland, Ohio.
Commonwealth Brass Corporation, Detroit, Mich.
Dunham Co., C. A., Chicago, Ill.
Fulton Co., Knoxville, Tenn.
Gorton & Lidgerwood Co., New York.
Ideal Heating Equip. Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Marsh Valve Co., Dunkirk, N. Y.
Milwaukee Valve Co., Milwaukee, Wis.
Powell Co., Wm., Cincinnati, O.
Powers Regulator Co., Chicago, Ill.
Trane Co., La Crosse, Wis.
Scott Valve Mfg. Co., Detroit, Mich.
Simplex Heating Specialty Co., Inc., Lynchburg, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.

Reducing.
American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johnson Service Co., Milwaukee, Wis.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Powell Co., Wm., Cincinnati, O.
Powers Regulator Co., Chicago, Ill.
Atlas Valve Co., Newark, N. J.

Regulating.
American District Steam Co., No. Tonawanda, N. Y.
Fulton Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Powell Co., Wm., Cincinnati, O.
Powers Regulator Co., Chicago, Ill.

Relief (Water).
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Powell Co., Wm., Cincinnati, Ohio.

Safety.
American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Jenkins Bros., New York.
Powell Co., Wm., Cincinnati, O.

Stop and Check.
(See Valves, Non Return).

VENTILATING HEATERS

Portable Unit.
American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, Ohio.
H. W. Nelson Co., Moline, Ill.
Nesbitt, John J., Inc., Atlantic City, N. J.
Peerless Unit Ventilating Co., New York.
Stickle Steam Specialties Co., Indianapolis, Ind.
Sturtevant Co., B. F., Hyde Park, Mass.
York Heating & Ventilating Co., Philadelphia, Pa.
(See also Heaters, Portable Unit Air).

VENTILATING SYSTEMS

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila, Pa.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corporation, Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
H. W. Nelson Co., Moline, Ill.
Nesbitt, John J., Inc., Atlantic City, N. J.
New York Blower Co., Chicago, Ill.
Peerless Unit Ventilating Co., New York.
Seymour, James M., Newark, N. J.
Skinner Bros. Mfg. Co., St. Louis Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg Co., New York.
York Heating & Ventilating Co., Philadelphia, Pa.

VENTILATORS.

Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Ilg Electric Ventilating Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Seymour, James M., Newark, N. J.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.

Mushroom.
Knowles Mushroom Ventilator Co., New York.
Lyon Products Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.
York Heating & Ventilating Co., Philadelphia, Pa.

WEATHER STRIPS.

Metal.
Athey Company, Chicago, Ill.
Chamberlin Metal Weather Strip Co., Detroit, Mich.
Higgin Manufacturing Co., Newport, Ky.
Monarch Metal Products Co., St. Louis, Mo.

WELDING MATERIALS.

Linde Air Products Co., New York.
Oxweld Acetylene Co., Long Island City, N. Y.
Prest-O-Lite Co., Inc., New York.

YOUNG

CENTRIFUGAL VACUUM AND BOILER FEED

PUMPS

SUPPLIED IN STANDARD UNITS OF SIX CAPACITIES

We furnish Young Centrifugal Vacuum and Boiler Feed Pumps in six capacities, ranging from 5,000 to 65,000 square feet of direct radiation. Standard Units V1, V2, V3, V4 and V5 are built to discharge against a pressure of not more than 20 pounds at the pump. Standard Unit V0 is built to discharge against 18 pounds pressure at the pump. (We also make *special* pumps of these same unit numbers to discharge against 35 pounds.) Both standard and special units are furnished for either continuous or automatic control.

The air and water capacity of all Young Pumps are more than ample for the operating requirements of a vacuum heating system.

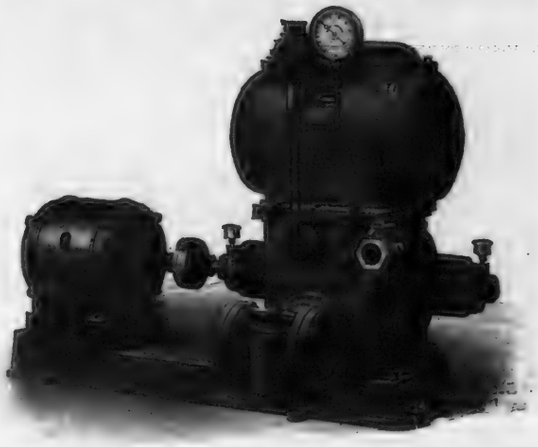
For Bulletins address:

YOUNG PUMP COMPANY

230 EAST OHIO STREET, CHICAGO

FACTORY: MICHIGAN CITY, INDIANA

SKIDMORE



The New Type "B"

THE Skidmore Hydro Turbine Vacuum and Boiler Feed Pump is now entering its fifth year.

Units that have been in service four heating seasons show the same efficiency that was shown when installed.

The new type offered retains all the advantages of those now in service, the change in design being in the casing to secure a more compact and sturdy unit.

All parts are of high grade cast iron or bronze, accurately machined.

There are no close clearances on moving parts and no piping is required to set the unit.

A self-contained unit all on one base.

Built in seven sizes for 10 to 60 lbs. pressure to handle 5,000, 8,000, 16,000, 26,000, 40,000, 65,000 and 100,000 sq. ft. of radiation for continuous service or with automatic control.

SKIDMORE CORPORATION

General Offices and Factory

1535 Dayton St. CHICAGO, U. S. A.

ALPHABETICAL INDEX TO ADVERTISEMENTS

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Lenox Line of Gurney Boilers

No. 20 Lenox Steam Boiler

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Made in ten sizes, permitting a wide selection.

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No. 19 Lenox Water Boiler

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GURNEY HEATER M'F'G CO., Richmond, Va., 418 East Main St.

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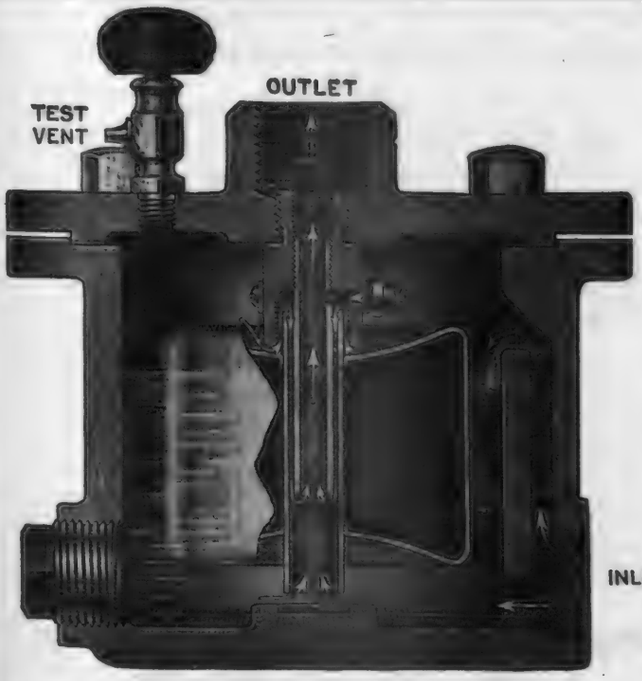

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DUPLEX WATER SEAL LOW PRESSURE

BLAST TRAP

for direct or indirect coils or any location where large quantities of water are to be discharged

Operates automatically either with or without mechanical suction on return line.

No complicated parts to stick or get out of order.

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Manufacturers of Radiator Traps and Specialties—Automatic Air Valves and Vents Indicating and Recording Gauges

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GENERAL BOILERS COMPANY, *Waukegan, Ill.*

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STEEL HEATING BOILERS

KEWANEE

TABASCO [HOT STUFF] STEEL-RIVETED WATER HEATERS

Are designed with Boiler-size Doors for convenience in firing-up and cleaning out.

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Built on over 45 years of sound, practical experience in the manufacture of high grade boilers.

Let us send Catalog H-9

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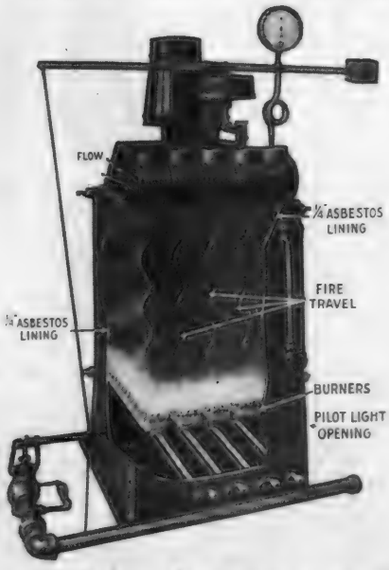
SPECIFY
Universal Gas Boilers



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Economical operation
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The Universal Smokeless Boiler Co.
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Draft Conditioners

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Also they save labor by helping to completely burn the fuel and minimize the ash.

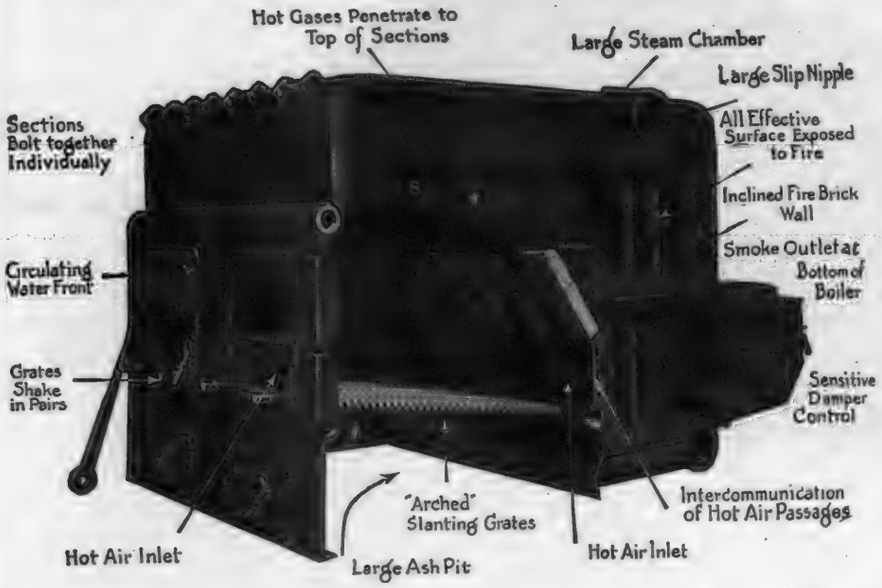
And: They provide a building with almost perfect heating conditions—and every owner knows that happy tenants mean money in his pocket.

Heating Contractors can make money selling them.

Wolff Coal Saver Co.

1336 West Congress St., Chicago

Ask Us Why Low Water Line Is Best


Hot Gases Penetrate to Top of Sections
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Large Slip Nipple
All Effective Surface Exposed to Fire
Inclined Fire Brick Wall
Smoke Outlet at Bottom of Boiler
Sections Bolt together Individually
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Hot Air Inlet
Large Ash Pit
Hot Air Inlet

Makes possible a large steam chamber, assuring steady, constant pressure.

Allows the use of smaller mains, as the height to which condensation can back up in the return increases as the water line is lowered.

Permits a low over-all height fitting the Niagara Boiler to basements and low ceilings.

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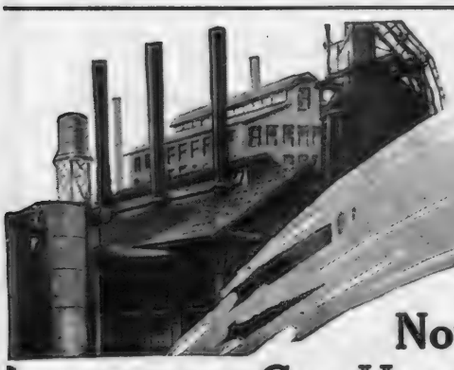
NIAGARA RADIATOR & BOILER COMPANY

General Office and Factory—North Tonawanda, N. Y. **Branch Office and Factory—Chicago, Ill.**

NIAGARA LOW WATER LINE SMOKELESS BOILERS



Now Industrial Plants Can Have "Ship-Safe" Equipment

Ships have to be extremely careful when they select equipment. Nothing must go wrong when they are miles out to sea. That is the reason why "ship-safe" has come to mean the surest kind of safety.

For years Paracoil equipment has been accepted as "ship-safe" on the world's greatest vessels, where reliability and good workmanship are first considerations.

Now industrial plants can have "ship-safe" equipment. Paracoil steam traps, feed water heaters, storage water heaters, grease extractors, evaporators, heat exchangers, etc., are offered industrial plants with the same assurance of long service and reliability that has made the name "Paracoil" standard throughout the marine world.

You can be sure of these products. A responsible firm, with 20 years' experience, stands back of them.

End maintenance troubles by installing Paracoil equipment, which carries a rigid guarantee both of workmanship and service.

Write for booklet, describing in detail any of the above products.

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Paracoil

INTERNATIONAL

ECONOMY BOILERS

Heat absorbing surfaces designed for most effective use of heat.

Steam dome and positive circulation of water arranged to deliver dry steam without a header.

STEAM SECTIONAL TYPE

Large firepot holds plenty of fuel.

Positive circulation of gases and water.

Maximum generation of heat contained in fuel.

TIME-TESTED

Principles of construction followed in building Economy Boilers have been developed through eighty-four years of experience in manufacturing heating equipment.

What a confidence-building fact!

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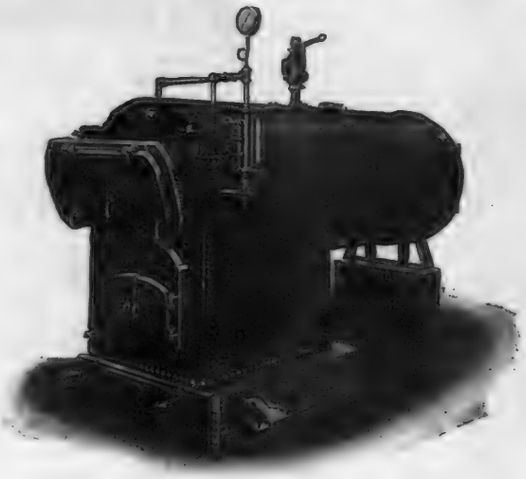
AMES
Firebox Heating Boilers



Ames Firebox Heating Boiler with Plain Furnace

Built with Plain and Downdraft Furnaces. Incorporating the Latest and Most Advanced Ideas in Boiler Design and Construction.

We also build a complete line of Horizontal Tubular, Upright and Empire Boilers for Heating and Power Requirements.

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Empire Return Tubular Portable Boiler

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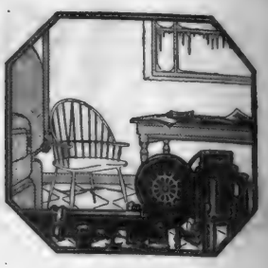

Some facts about oil heat—

For Architects, Heating Contractors, Builders, and all who are interested in heating homes (large or small)—and larger buildings.

IN AMERICA today there are approximately 79,000 homes heated by oil-burning devices. These devices are produced by 347 different manufacturers.

Of them, about one-third—26,000—are NOKOL installations.

No other oil-burning device approaches NOKOL in numbers of actual installations. For the NOKOL figures do not include burners in dealers' hands, waiting sale.

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The oil-burning industry was founded by NOKOL makers. Since then the industry has been led constantly—by NOKOL.

Today NOKOL sales and installations are being made faster—in greater numbers—than ever before.

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The reasons, briefly, are: fully automatic operation; economy—costs less than burning hard-coal; permanent efficiency—proved by performance records; the responsibility and solidarity of NOKOL makers, and dealers everywhere.

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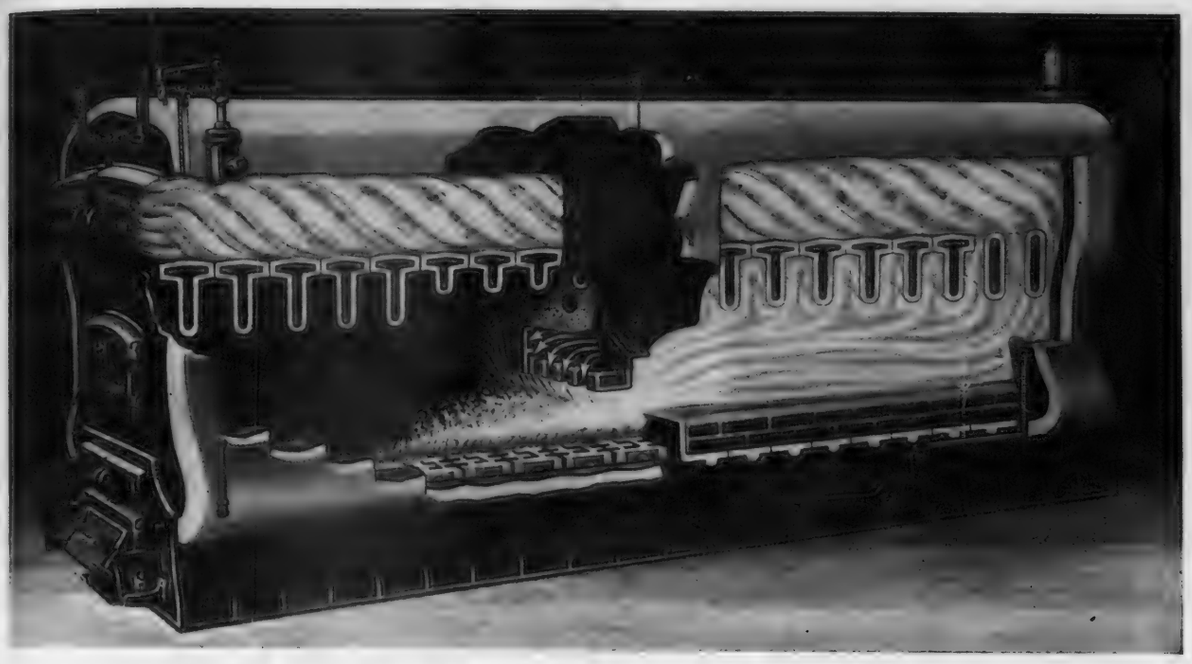
Complete proof and data, for your files, will be sent on request.

NO COAL
NOKOL
Automatic Oil Heating for Homes

NOKOL Automatic Oil Heaters tested and listed as Standard by the Underwriters' Laboratories, and approved by all principal Safety Boards

Manufactured and Guaranteed by
AMERICAN NOKOL COMPANY, Chicago



Cutaway View of Utica-Imperial SUPER-SMOKELESS Boiler

UTICA-IMPERIAL
SUPER-SMOKELESS BOILERS

Smoke and Soot are Burned as Fuel!

A recent improvement put the Air Regulation under easy control from the front of the boiler.

Exterior View of Boiler

Utica-Imperial SUPER-SMOKELESS Boilers burn smoke and soot within the boiler, as fuel of remarkable heating value, thus not only eliminating smoke but also attaining remarkable economy and efficiency. This is accomplished by admitting heated air to the fire, on the principle of the Bunsen Burner, igniting the volatile gases and converting them into hot, clean flames of great intensity. The rotative velocity of these hot flames (2400° F. in temperature) not only imparts great heat to the water, but scours the flues clean as well, thus making them clean, efficient heating surfaces. Utica-Imperial SUPER-SMOKELESS Boilers are economical, efficient and easy to operate. Engineers and Contractors are invited to write for complete information.

Manufactured by the

UTICA HEATER COMPANY

UTICA, NEW YORK

CHICAGO CLEVELAND NEW YORK

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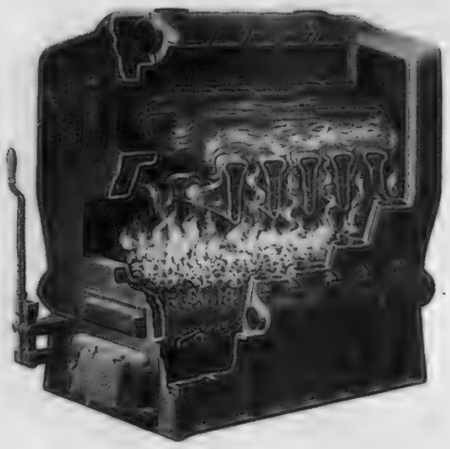

Long Three-Way Fire Travel

On Each Side of the Boiler

It means that you get the heat before the chimney gets it.

You get it in the form of steam or hot water. And you get it quick—when the boiler is a

BURNHAM

Square Sectional Boiler

Another economy feature:—In mild weather only the front half of the grate need be used. It operates in two sections. Keeping the flues clean is also easy; there's a door for each flue. All operating parts are in front. Sections can be added to either the front or rear. Complete information in Burnham Catalog. Send for it.

Burnham Boiler Corporation

IRVINGTON, N. Y.

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Canadian Offices:
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124 Stanley St., Montreal

Combination Heating for Circle Inn

Circle Inn, on the Boulevard, Revere, Massachusetts, a One-Pipe Steam System

COMBINATION Heating employing Clow Gasteam Radiators hooked into a one-pipe steam system gives this hostelry a heating system that meets seasonal demands.

The Clow Gasteam Radiators function as ordinary radiators when the heating plant is running.

When the heating plant is shut down, the Gasteam Radiators produce their own steam.

Combination Heating permits of:

Starting the heating plant a month or two later in the fall. Shutting down the heating plant a month or two earlier in the Spring.

For further information address:

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534-546 S. Franklin St., Chicago
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Each Radiator an Independent Steam Heating Plant

CLOW

GASTEAM — GASWATER

The Oxidizer that makes the Boiler smokeless

By feeding fresh air to the fumes rising from the fire-bed, the Ideal Smoke Oxidizer completely consumes the smoke particles which these fumes contain, allowing them to pass out of the chimney as a colorless gas.

This IDEAL SMOKELESS BOILER
—*burns its own smoke*

IDEAL SMOKELESS BOILERS not only make cities cleaner, but they convert into effective heat those fine particles of rich carbon that ordinary boilers send up the chimney flues to make smoke black.

The IDEAL Smoke Oxidizer which makes these results possible is fully illustrated in the diagrams; all IDEAL Smokeless Boilers are equipped with it. Fuel economy is so marked when it is used that many Architects and Heating Engineers specify it on all their large heating jobs, even when no local Smoke Ordinances make it necessary.

IDEAL Smokeless Boilers are designed in four sizes: 29, 36, 48 and 79 inch, for both steam and hot water. Capacities are as follows: Steam, 2,000 to 20,400 square feet; water, 3,250 to 32,640 square feet. If you haven't full data in your files, simply address the office below.

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SUPPORTING MEMBER

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IDEAL BOILERS AND AMERICAN RADIATORS FOR EVERY HEATING NEED

Thrush System of Hot Water Heating Sells because—

Thrush System Saves steps

Thrush System Saves coal

Thrush System insures even heat *always*

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PERU INDIANA

CAREFUL PLANNING SUPERVISION TESTING

Justify the faith placed in Whitlock Products—as evidenced by the choice of **Whitlock Heaters** for such outstanding buildings as the Hotels Sherman and Morrison of Chicago, and hundreds of other recent installations.

Whitlock Heaters are made—from raw materials to finished product—in one factory—under the supervision of an experienced organization.

Whitlock Heaters are distributed by a national organization reaching from coast to coast.

Whitlock Heaters are dependable.

THE WHITLOCK COIL PIPE CO.
40 South Street, Hartford, Conn.
New York Chicago Boston Buffalo Philadelphia
San Francisco

WHITLOCK HEAT TRANSFER PRODUCTS

PAGE BOILERS

"The Distinguished Service Line"

Ratings of Page Boilers have not been changed. They are derived from careful and exhaustive tests, during years of service under every condition, which proved their safety.

We have a complete stock of all sizes of boilers and can make **immediate shipment** from convenient shipping centers.

Monarch Smokeless

Volunteer (steam)

Volunteer (water)

Monarch (header type)

THE WM. H.
PAGE BOILER CO.

58 West 40th Street
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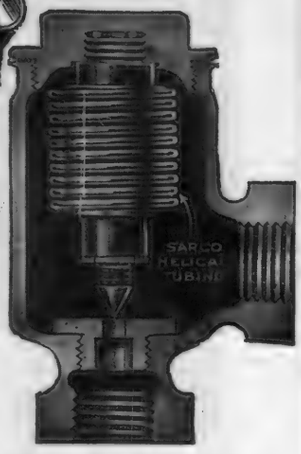
BOSTON
PHILADELPHIA

CLEVELAND
MEADVILLE

Established 1856 Incorporated 1877

It Adjusts Itself!



There is no time wasted—no unnecessary work—no danger of wrong adjustment by inexperienced help with the new No. 9 Sarco Steam Trap. It is ready for business as soon as you screw it into the pipe line. It works perfectly at any pressure between 0 and 100 lbs.

Large valve area and quick lift when discharging gives the Sarco unusually large capacity. And it closes just as promptly, preventing escape of live steam.

Has only the one moving part—nothing to get out of order. The seamless bronze helical bellows, which distributes the wear over the entire number of corrugations, makes this part almost wear-proof.

But the most surprising thing about the Sarco is that it costs about two-thirds **less** than most traps. Why not try a Sarco for thirty days without cost? We will take it back and thank you for giving it a trial if not entirely satisfactory.

Mail coupon below for Booklet P-254 and full particulars.

SARCO CO., Inc.

231 Broadway, New York City

Boston Buffalo Chicago Cleveland Detroit Philadelphia

Peacock Bros., Ltd., Montreal

SARCO STEAM TRAP

No. 9

SARCO CO., Inc.,
231 Broadway, New York City.

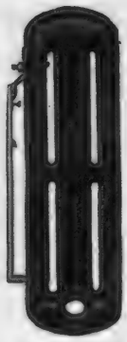
Please send Booklet P-254 and full information and prices on the new No. 9 Sarco Steam Traps checked:

☐ Size..... Pressure.....☐ Size.....Pressure.....

Firm .....

By.....

City..... State.....



The Frank Legless Radiator Bracket

(PATENTED)

Easiest to Hang
Greater Adjustment

Requires

ONLY ONE BOLT

Save 12 cents and up on each bracket plus cost of drilling and inserting extra bolts.

A Clean Concealed Job

Invented by John C. Frank, a steamfitter of long experience, who has also invented the Frank

Single Wall Brackets
Double Wall Brackets
Ceiling Radiator Hanger
Ball Bearing Expansion Hook Plate, Adjustable Steel Hook Plates, Coil Spreaders and Hangers.

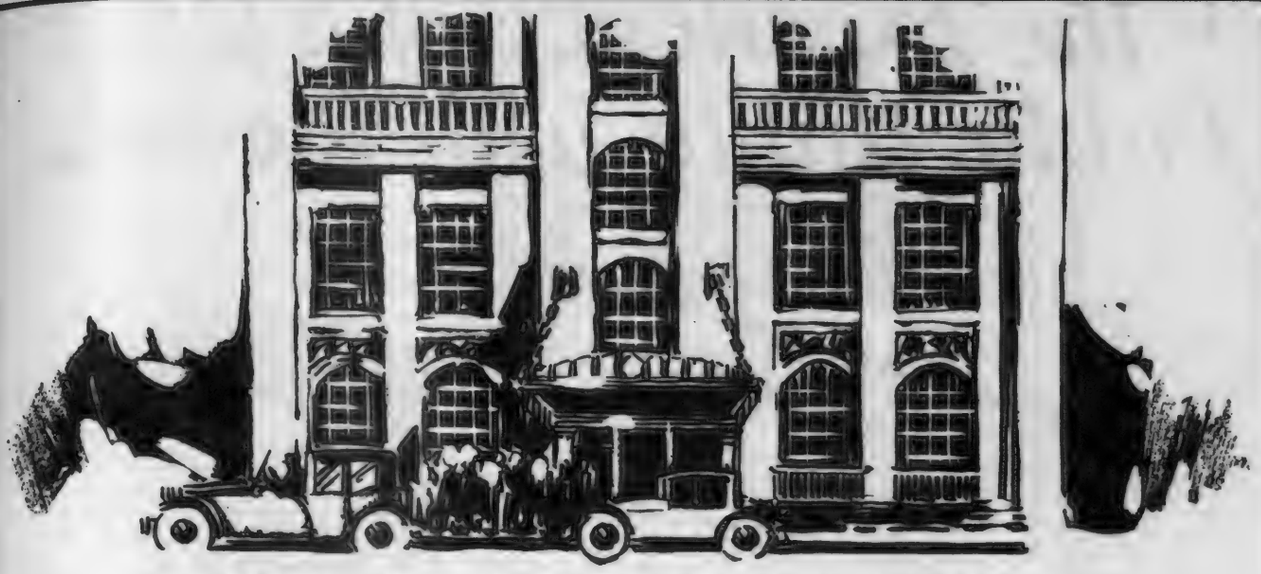
All are described fully in our pocket size catalog. Please ask for it.

THE FRANK RADIATOR BRACKET CO.
30 No. LaSalle St., Chicago

We are prepared to make special brackets to order.

FRANK ADJUSTABLE STEEL INSERTS for

CONCRETE WORK. FURNISHED IN ANY LENGTH REQUIRED WITH NECESSARY CLAMPS.

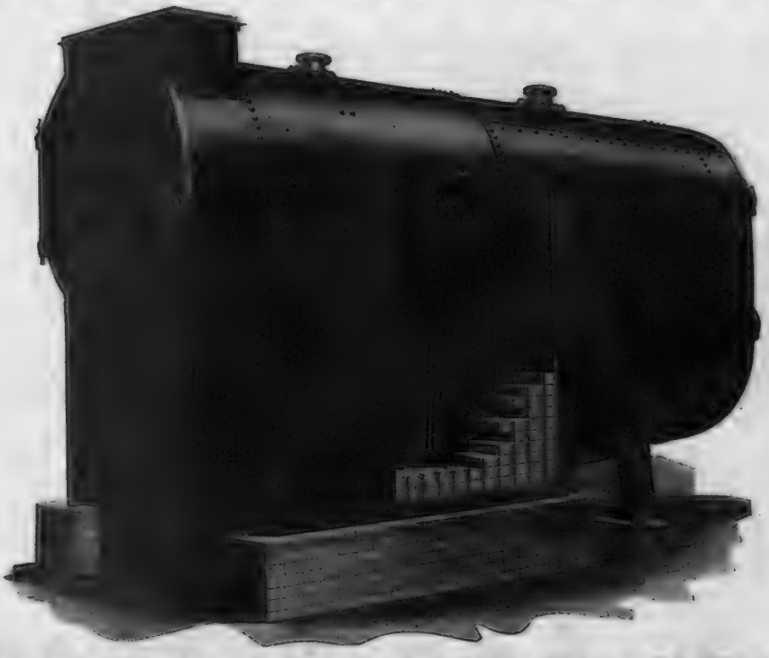


TITUSVILLE Perfection Boilers with their high brick lined firebox, steel casing and large effective heating surface, assure complete combustion of all fuels—solid, liquid or gaseous—and lower fuel bills.

Built for power or steam heating, pressures 15 lbs. to 150 lbs. Can be readily adapted for oil burning.

Catalog No. 85-A of Titusville Boilers should be in the file of all architects and engineers.

TITUSVILLE
PERFECTION BOILERS



THE TITUSVILLE IRON WORKS COMPANY

TITUSVILLE, PENNA.

SALES OFFICES:

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Detroit, Mich.
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The Experience of a large Public Utility with Ric-wiL

ROCHESTER GAS AND ELECTRIC CORPORATION

ROCHESTER, N.Y.

R. M. SEARLE, PRESIDENT
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J. C. COLLINS, SECRETARY & TREASURER
C. A. TUCKER, ASST TREASURER
E. C. SCOBELL, GENERAL AUDITOR

September 17, 1925

Mr. Ralph T. Coe
R. T. Coe Company
Cutler Bldg.
Rochester, N. Y.

Dear Sir:

In response to your recent inquiry in regard to our experience with the RicWil steam main insulation and conduit, we wish to say that we are entirely satisfied with the construction. We feel that it is efficient, both from the heat insulating and mechanical standpoint.

In September 1923 we installed approximately 900 ft. of Ric Wil Type D.F. conduit as insulation for a six inch and two inch high pressure line. Both these lines are acetylene welded steel pipe, carrying steam at 190 lbs. pressure and approximately 75 degrees superheat. As indicated, by our monthly condensation and heat loss check, this line is very well insulated.

Before deciding on the use of Ric Wil conduit for part of the new steam main construction here this year, an inspection was made of the above job which had been through two complete heating seasons. A length was uncovered, disclosing the fact that the tile, drain, moulded insulation and loose filler were all as originally laid in so far as visual inspection could determine. At the point of opening the main has a maximum travel, due to expansion, of approximately 16 in. which is, of course, a very severe test of the ability of the loose filler to remain as placed. The loose filler was cool to the touch and apparently in perfect condition.

Trusting that the above summary supplies the information which you desire, I am

Very truly yours,

Landis Shaw Smith

Landis Shaw Smith, Engineer
Industrial Sales Department.

LSS:S

The new Lawn Street Central Heating Plant, Rochester, N. Y., of the Rochester Gas and Electric Corp. Devoted exclusively to the efficient production of steam heat.

This is the kind of service you assure your clients when you specify Ric-wiL.

THE RIC-WIL COMPANY, Cleveland, Ohio

RIC WIL

UNDERGROUND CONDUIT

AT HOME

The highest compliment that can be paid to a politician—"He always carries his home precinct."

Compliment that it is to politicians—a proof of satisfactory service—it is no less true of mechanical equipment and steam specialties. When you want to get the "inside dope" on steam specialties, find out how they stand "at home."

Below is a list of 36 heating contractors in Chicago, many of them nationally known, who recommend and use The McDonnell & Miller Duplex Water Feeder. Draw your own conclusions as to how it stands "at home:"

Adelman Heating Company
Advance Heating Company
American Plbg. & Htg. Co.
Baldwin, J. P. Company
Blatz, E. B.
Claffey, E. J.
Davidson, Walter
Davis Construction Co.
Davis-Metzger
Douglass, Thom. J. & Co.
Gordon, Robert, Inc.
Graves, W. B. Heating Co.
Jensen, Hans.
Johnson, C. W. Inc.
Kehm Brothers Company
Keppner, H. W.
Kilander, A. & Company
Killian, Thomas J.
Kohlbry-Howlett Co.
Lavelle, James F. & Son
Lees, William
McKittrick, Jas. J.
Miller, Paul H.
Mimmack Heating Company
Nilson Brothers
No. Shore Plbg. & Htg. Shop
Northwestern Plbg. & Htg.
Phillips, Getschow Co.
Pope, William A.
Reynolds, S. J. Co., Inc.
Schampel & Dougherty, Inc.
Sherman & Son
Spires, A. P.
Suburban Heating Company
Western Heating Company
Wold Heating Company

While we're on the subject, McDonnell & Miller Duplex Water Feeders are also "at home" on any kind of a low pressure steam job. They are protection alike to cast iron or steel boilers, eliminating all the many troubles that may be caused from low water or high.

McDONNELL & MILLER

"DOING ONE THING WELL"

General Offices
WRIGLEY BUILDING
CHICAGO

Eastern Warehouse Stock
BUSH TERMINAL
NEW YORK

A frank comparison. Study these four types of oil burner flames. They shatter many pet illusions.

BUT there is no room for illusions when buying an oil burner. These illustrations are FACTS. They don't ask our acknowledgment; we don't have to accept them—but still they remain, Facts.

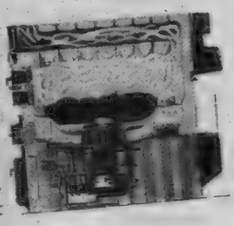
We can shut our eyes to them; we can shake our heads in denial; in refutation, sweet-sounding yarns can be launched—but still they stand as, Facts.

Eloquently they show why ABC is the economical burner.

ABC Flame

Unlike any other burner the ABC flame heats from the grate level. Your boiler was not designed to receive heat in any other manner.

A flame other than from the grate is a makeshift and contrary to the intended function of your heating plant.

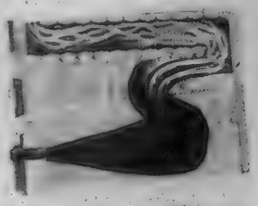


The horizontal circular flame is evenly and gently distributed all around your boiler. It is exactly like a coal fire—plus oil's greater efficiency when properly burned. There are no unnatural drafts. Starting at the water legs, the heat

rises slowly, allowing maximum absorption by your boiler.

No wasteful fan blows heat up your chimney. ABC will cost you less to heat your home because from every gallon of oil you will get more heat.

Nozzle Type Flames



The two nozzle types of oil burner flames are obviously less efficient than a circular flame although they are pictured here to their best advantage. They are better adaptable for long boilers of the industrial type.

What are the disadvantages of nozzle flame?

1. High velocity—the flame is blown into the boiler at a speed far in excess of the rated heat absorbing ability of the boiler. What is the result? An extravagant amount of heat is lost—blown up the chimney.

2. Slower heat—the concentrated flame does not permit an even distribution of heat. Unlike an ABC flame the water legs are not directly heated. Much of the boiler's surface is little used. The high velocity of the flame, creating an unnatural draft, prevents the hot gases from circulating in the boiler and coming in contact with all of the heat absorbing surfaces. The penalties are slower heat; less heat.

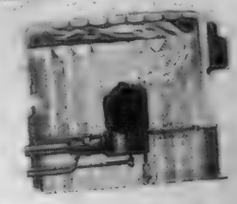
3. Noise—there is a stubborn oil burning combustion law which says, "Air blown onto oil when in a state of combustion will produce noise." High velocity and noise are inseparable culprits.

Pot Type Flame

The pot type flame has every one of the drawbacks of the nozzle type flame. Study the illustration and it will at once be apparent why this type of flame can never be as economical as an ABC flame.

Notice that the metallic combustion pot is in the center of the boiler. The flame is vertical and is all concentrated on the crown sheet of the boiler.

The high artificial draft forces the heat from the pot to the crown sheet, through the boiler and out of the chimney.



Two pages (reduced) from the "Biography of King of Heat." For the first time some little known oil burner facts are told. If you like the truth, without sugar-coating, this booklet will appeal to you.

ABC wants live dealers

When you take the exclusive agency for an oil burner you will shun the untested devices—you don't want to pay the manufacturer's experimental expenses.

ABC is a pioneer. Five years old—over 5000 installations. Over $200,000.00 has been spent in perfecting ABC since the first burner was sold.

ABC today is more than just another oil burner. It is the only burner that retains the natural functions of a coal burning boiler. That's why ABC is a fuel saver.

Investigate Now

Tomorrow the exclusive agency for your territory may be closed. All progressive heating men know that oil burners are in demand. The only reason they have not taken on a burner is because they have not found one they like. ABC talks their language; they understand it.

"The Biography of King of Heat" gives the facts, unsweetened. Write for it today.

Listed as Standard by Underwriter's Laboratories.

AUTOMATIC BURNER CORPORATION
312 North May Street, Chicago

ABC OIL BURNER

no noise ~ no carbon

How to overcome the competition of over-rated boilers

When—

it dawns upon the public that adequate Fire Surface and a conservative Boiler Rating are the two things that lead to heating efficiency and economy.

Then—

the competition of the over-rated boiler will automatically pass out of existence

BUT, until such a time arrives, architects and heating contractors can overcome the competition of the over-rated boiler by explaining to prospects the economical necessity for a fairly rated boiler with a properly designed and adequate fire surface.

H. B. Smith Boilers, made since 1860, are scientifically designed so that every square inch of fire surface is presented as advantageously as possible to the fire. And every H. B. Smith Boiler is so rated that there are enough square inches of fire surface to absorb at a comparatively low temperature the required amount of heat. It is this combination which saves fuel and reduces the cost of heating. That is what a man wants in a boiler he buys.

To help architects and heating contractors acquaint their clients with the economical necessity for a fairly rated boiler (and this helps them to overcome the competition of the over-rated boiler) we have recently issued a 32-page booklet, "The Truth About Boiler Ratings." This booklet contains such a simple, common-sense explanation of this phase of heating that, after you have read it, you will want every one of your prospective customers to read it. Just fill out the coupon below and we will be glad to send you a copy with our compliments.

THE H. B. SMITH COMPANY
Home Office and Works
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THE H·B·SMITH
BOILERS & RADIATORS
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THE H. B. SMITH COMPANY, Dept. J-3, Westfield, Mass.
Send a copy of your new booklet on Boiler Ratings to:

Name .....
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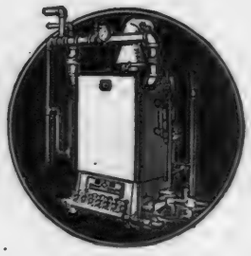
BRYANT HEATING

for Hot Water, Steam AUTOMATIC GAS Vapor *and* Warm Air

Clean, Carefree Heating at Moderate Cost!



Practically all gas companies now grant special reductions on gas for house heating. Efficiently burned, the cost of this clean, carefree fuel is now well within reach of most homes. Let the nearest Bryant office give facts and figures.

THE BRYANT HEATER & MFG. COMPANY
17854 St. Clair Avenue Cleveland, Ohio

Branches in 21 Principal Cities

A few more well-known Architects who specify Bryant Automatic Gas Heating.

Chas. E. Firestone Co.
Canton, Ohio

Dubois & Goodrich
Casper, Wy.

F. Haenssler
St. Louis, Mo.

Leon E. Stanhope
Chicago, Ill.

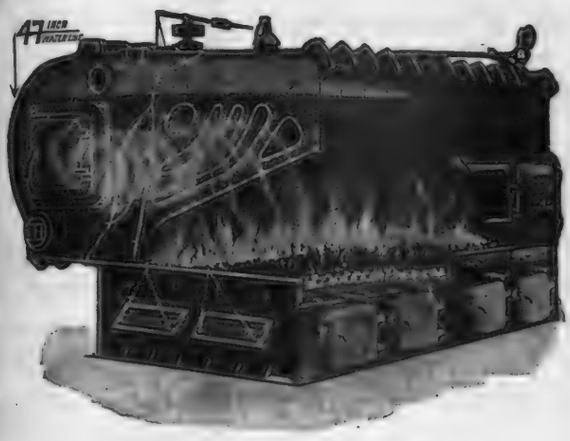
Wm. E. & Arthur A. Fisher
Denver, Colo.

A. Lincoln Fechheimer
Cincinnati, Ohio

W. H. Emory, Jr.
Baltimore, Md.

Continental

BOILERS AND RADIATORS



How Continental Low Water Line Boilers Save Installation Worries

A 43 or 47 inch water line is just one of the installation economies of the Continental Low Water Line Boiler.

Here's more good reading to men who know boilers—

GOOD CASTINGS

Continental Low Water Line Boilers are made of fine grey-iron castings free from defects. And Continental doesn't leave the inspecting to the steam fitters on the job.

EASY TO ASSEMBLE

No Continental Low Water Line Boiler is shipped until it has been completely set up and tested under pressure. They go together easily on the job because they've gone together at the factory.

NO LEAKS

Good castings, good machining, good inspection, all make good insurance against leaks after the boiler is set up.

PROMPT SHIPMENTS

A large stock of all sizes for immediate shipment saves many a golden hour for busy heating contractors.

Write for catalogue giving twelve-year-old ratings.

Continental Heater Corporation
Dunkirk, N. Y. U.S.A.

BUILT FOR BETTER HEATING

THE THATCHER ROUND BOILER —Steam or Hot Water. Staggered fire travel puts smoke and gases to work. Automatic regulation, comfortable heat at all times. Economical on fuel. Long firing periods. Different sizes and capacities for individual requirements.

We know a man—

whose business is backed by his manufacturer's national advertising campaign; who receives unlimited encouragement in the shape of complete advertisements to run in his local paper, display hangers, signs and a wide selection of printed matter for prospects—all without cost; obtains practical information on his particular heating problems; finds local prospects handed over to him by the main office; gets the heartiest co-operation from headquarters in every way; and best of all, he's making money:—*He is a typical Thatcher Dealer.* Are YOU One?

You will find it pays to know Thatcher. Let's get together. Write at once for full details on Sales and Advertising Helps for Dealers. Also the latest Boiler Catalog.

THE THATCHER COMPANY

Formerly Thatcher Furnace Co.
Since 1850

341 N. Clark St. Chicago — 39-41 St. Francis St. NEWARK, N. J. — 21 W. 44th St. New York

THATCHER

BOILERS-FURNACES-RANGES

This Will Help You in Your Business
A new bulletin of valuable information for Plumbing and Heating Contractors, fully illustrated and containing numerous tables of practical data, charts, diagrams, specifications and a chapter on major considerations in the installation of general plumbing systems. A copy free upon request—write today for yours.
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Frick Building, Pittsburgh, Pa.
"NATIONAL" BULLETIN
NUMBER 19
Copyright 1925 National Tube Company, Pittsburgh, Pa.
1st EDITION
"NATIONAL" PIPE
FOR PLUMBING AND HEATING

LONG LOOKED FOR—now here!

CombustiKator—the Ultomatic Coal Burner. The entire heating industry acclaims the **CombustiKator** the solution to the coal burning problem. At last the drudgery and smoke of burning coal have been eliminated. The **CombustiKator** is smokeless, super-simple, efficient and foolproof. More than a coal burner, the **CombustiKator** is also a "system" of combustion that combines the advantages of the gas producer with those of the mechanical stoker.

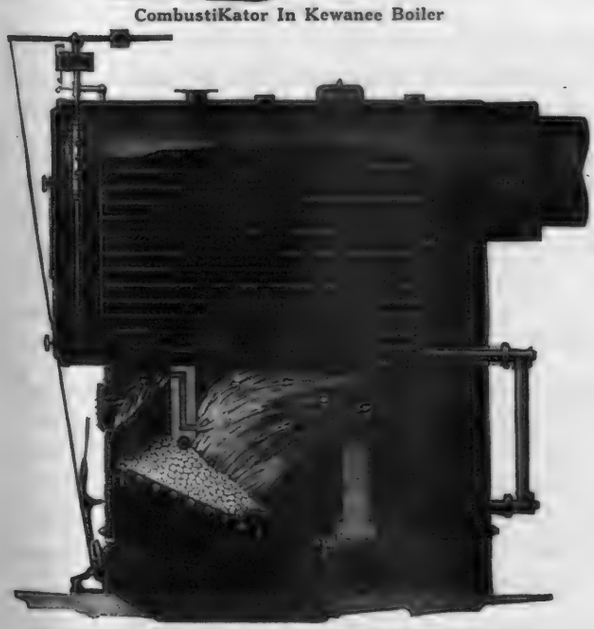
Cleaning Periods are Eliminated
Smoke is Positively Prevented
Cheaper Sizes and Grades of Coal Suffice

Nothing could be simpler than operating the CombustiKator:

1. **Coal is thrown through firing door, against wall of inside hopper;**
2. **Operating stoking lever moves coke over fuel bed while automatically cleaning fires, closing holes and scavenging clinker;**
3. **Releasing dump lever, disposes of ash.**

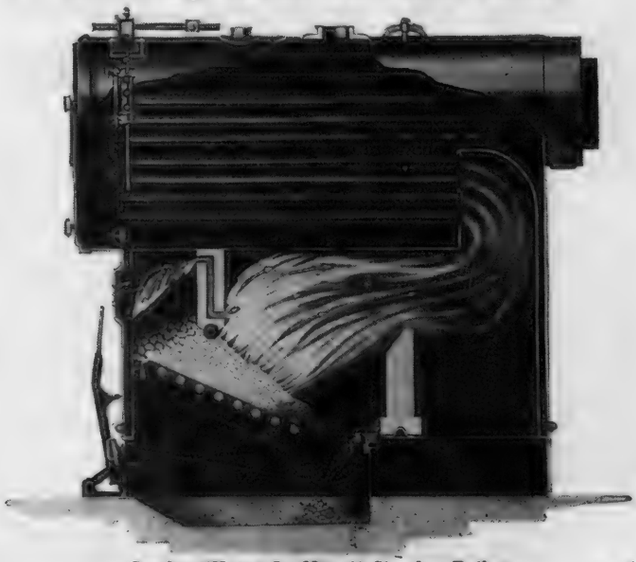
Nothing to Think About! No Skill or Knowledge Required—Mistakes are Impossible

CombustiKator In Kewanee Boiler



CombustiKator In Pacific Boiler

Large boilers are as easily fired by the **CombustiKator** as small boilers. It is as easy as operating the old-fashioned domestic magazine stove. The **CombustiKator** can be installed in all steel firebox boilers, whether new or already installed and in use; all return tubular boilers and horizontally baffled water-tube boilers.



CombustiKator In Heggie-Simplex Boiler

Green coal is thrown into inside hopper, where it is coked. The gases are driven off and pass through hopper refractory wall where they are preheated to enter the furnace where they are ignited. Coke only passes into the furnace. Green coal cannot reach active combustion zone. Combustion is smokeless and complete at all loads.

Send for the facts, specifications and selling franchises on this revolutionary coal burner.

Representatives in principal cities

The CombustiKator Company
Division of
CoKal Stoker Corporation
Wrigley Building, Chicago

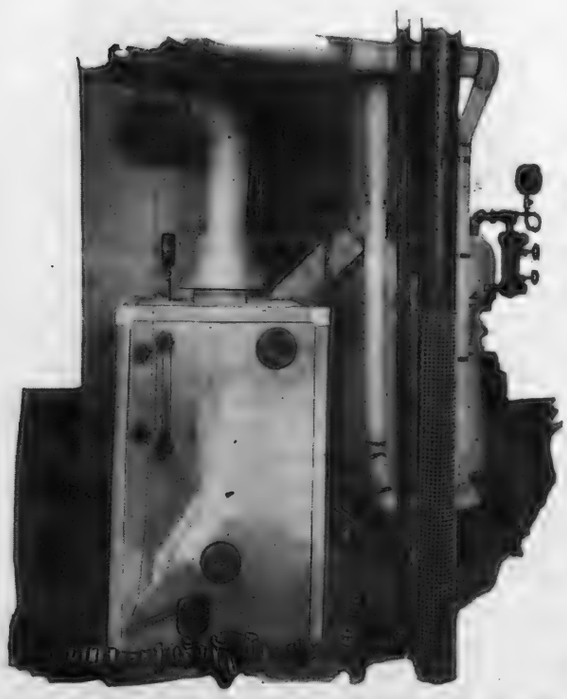
GET THE FACTS—Send in the Coupon

CombustiKator Company:
You can send me additional information about CombustiKators. I am interested in Specification ☐ Installation ☐
Name (Company) .....
(Individual) .....
Occupation or Title .....
Street Address .....
City ..... State .....

IDEAL Gas Boilers need "firing" but twice a year.

There are 80 John Smiths to one Van Rensselaer

IDEAL Gas Boilers are tested and rated under AGA code. Capacity required is therefore only 25% in excess of total condensing load, including piping. Efficiency attained, over 85%.



THE SMALL HOME is the big market for IDEAL Gas Boilers; the compact little house, with servants few, needs the automatic heating equipment that is "fired" but twice a year.

This photograph shows that even the possession of a coal-fired boiler need not prevent the sale of an IDEAL Gas Boiler. Owners often cross-connect their new IDEAL Gas Boilers to the old coal boiler, though coal is seldom used once gas is installed.

Why not let your local Gas Company help you sell *two* boilers where only one was sold before? They are your jobber on IDEAL Gas Boilers and your "service department" as well, for they systematically look after equipment installed on their lines. Your IDEAL Gas Boiler profit is a *clean* profit—yours *to keep*, not to spend in back-calls.

Get our comparative cost data and selling plan. We especially welcome inquiries from Heating Contractors now selling non-solid fuel accessories.

The A. H. Wolff Gas Radiator Co.

Distributors American Radiator Company's IDEAL Gas Boilers

376 Lafayette Street *Dept. G-71* New York, N.Y.

RAYFIELD

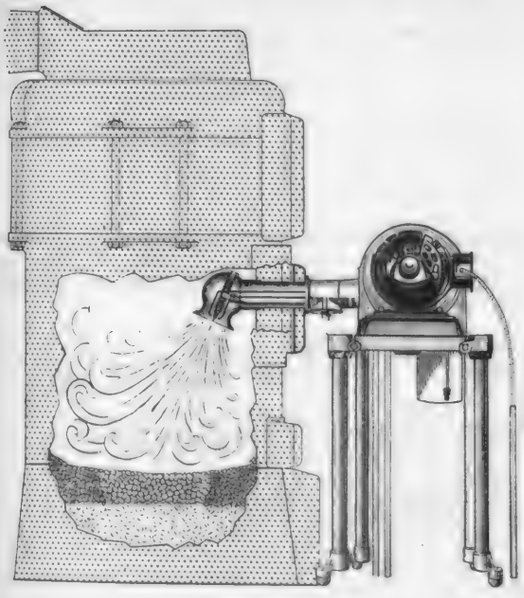
PATENTS PENDING

Automatic Fuel Oil Burner

wins the approval of

Heating Engineers *and* Heating Plant Manufacturers

The Rayfield is a Super-system of heating designed and perfected by Chas. L. Rayfield, inventor of the well-known Rayfield Carburetor for automobiles, and an acknowledged authority on the combustion of liquid fuels.



for the simple reason that the Rayfield carries out the practical operating principles found in the standard types of heating plants now in use.

In heating boilers and furnaces designed to burn coal the application of the maximum heat is at the bottom of the fire box. There is also a bed of coals to radiate heat during the periods of low fire.

These are sound, well established engineering principles, and it is obvious that an oil burner must meet these conditions in order to produce the best results. Both of these principles are incorporated in the Rayfield Automatic Fuel Oil Burner and it is the only domestic oil burner that fully utilizes the Radiant Heat principle.

Rayfield's Scientific Combustion

Note the illustration. The nozzle is suspended over the fire pot. The vapor, burning in suspension, is forced directly downward to the crushed fire brick at the bottom, then deflected to the sides and rises evenly along the walls of the fire box before the generated heat escapes through the flue. In this manner the flame travels twice the usual distance in the fire box, giving off the maximum heat at the bottom of the fire box and completing combustion before reaching the flue.

The Radiant Heat principle is utilized through the bed of crushed fire brick placed in the ash pit. In operation this brick quickly becomes incandescent, absorbing and saving the heat that would otherwise be lost up the chimney. Long after the burner has been shut off by the thermostat, this white-hot bed of crushed brick continues to radiate its stored heat and thus assists in maintaining an even temperature throughout the building.

For Steam, Vapor, Hot Water, Hot Air

The Rayfield is fully automatic and operates successfully in any good heating plant. It comes in various sizes and has had three years of practical tests in homes, apartments, theatres and factories.

You have been waiting a long time for this scientific oil burner—a burner that you would readily install in your own home after seeing a demonstration.

Send for illustrated circular

Rayfield Mfg. Co.

21st and Rockwell Sts. CHICAGO

Rayfield Burns 28°-30° Fuel Oil

This grade of Fuel Oil is lower in cost and higher in heat units than the lighter oils. We burn it as clean as illuminating gas—no smoke, no carbon, no residue and no odor. The Rayfield can burn the lighter oils but they are not so economical.

4 Exclusive Features

that make the Rayfield Supreme

1. **Utilizes the Radiant Heat Principle.**
2. **Perfected Electric Ignition.**
3. **Air-cooled, Non-carbonizing Nozzle.**
4. **Triple Atomization.**

Our Facilities and Organization

Our large plant is equipped with foundry, modern machinery, testing and assembly departments—everything necessary for economical and quantity production.

The same organization that produced the well-known Rayfield Carburetor is behind the Rayfield Oil Burner. Our reputation and responsibility are too well known to require further comment.

Contractor-Dealers Wanted

The Rayfield franchise will appeal to men who know the heating business. A profitable connection is offered responsible parties who are prepared to demonstrate, sell and install our equipment. Write for territory and further particulars.

On 1 to 2 oz. Pressure

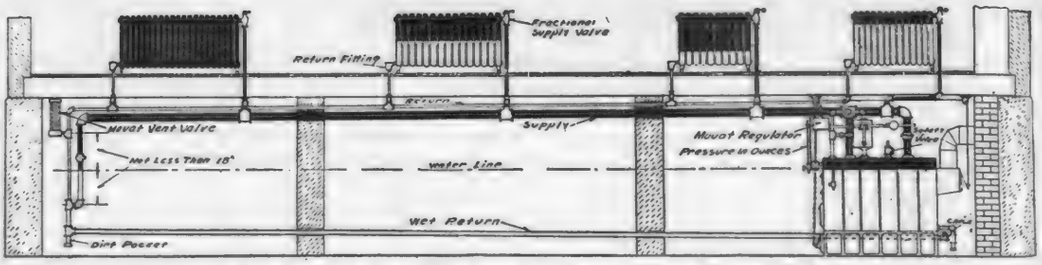
The Mouat System of Heating, a two-pipe gravity vapor or atmospheric steam heating system, operates at from 1 to 2 ounces pressure. No pumps, thermostatic valves, return traps or mechanically operated parts.

Shaded portions of the radiators in diagram below show how heat in radiators can be graduated or controlled, as desired, by the supply valves.

The control of the heat at the radiators, sensitive regulation of boilers and extremely low operating pressure make the Mouat an unusually economical system.

Send for detailed information.

MOUAT VAPOR HEATING COMPANY
CLEVELAND, OHIO



Showing how the Heat can be Graduated or Controlled

"VENTO" Advantages

System starts with valve wide open, assuring circulation almost the instant steam is turned on.

Control of valve opening from two to eight times larger than other makes of valves.

Size of valve opening reduces danger of fouling with scale or other foreign matter.

Closes absolutely tight against steam. No necessity for use of spray water at pump.

Cannot stick or gum from foreign matter, and operation is absolutely noiseless.

The Perfect Automatic Valve for Vacuum or Vapor Heating

The "Vento" Automatic Valve represents a steady improvement in the Haines line of steam traps and offers the highest degree of steam trap efficiency.

There has been no change in the old reliable principle that has placed Haines Automatic Valve in a class by itself. The operating power is identical—the only difference being in the general construction.

Special features are: Horizontal mounting of valve mechanism—long range of movement—positive action—quick opening and closing.

Send for booklet

WILLIAM S. HAINES & CO.
12th & Buttonwood Streets
PHILADELPHIA, - - PA.

VENTO

The Original Palmer House, 1873-1925
Webster-heated from 1895-1925

The NEW Palmer House—Holabird & Roche, Chicago, Architects
Thompson-Starrett Co., Genl. Contrs. Phillips, Getschow & Co., Htg. Contrs.

The service of experience

SHORTLY after the World's Fair—in 1895, to be exact—the owner of Chicago's famed hotel, the Palmer House, removed 700 stoves and fireplaces and installed in their stead a Webster Vacuum System of Steam Heating. Years of *successful* service was the strongest reason for choosing a Webster System for the *New* Palmer House, pictured above.

In this, soon to be the third largest habitable structure in the world, a Webster Vacuum System will heat the 2268 guest rooms (each with private bath).

Webster Service is a combination of modern equipment, engineering methods *and long experience* . . . an integral part of every Webster Vacuum and Modulation System of Steam Heating.

Let us give you the inside facts on Webster Service . . . outline our method of helping *you* from the very beginning of any special job!

Consulting Engineers

The extensive experience of the Webster organization has been, as far as possible, reduced to print and thus made available to those having heating design problems. We will be glad to have consulting engineers request this data—which will be supplied without charge.

Warren Webster & Company

Pioneers of the Vacuum System of Steam Heating

Camden, N. J. **50 Branch Offices**

In Canada, Darling Bros., Ltd., Montreal

- since 1888

Webster Systems of Steam Heating

More than 34,000 installations in America's finer buildings

See Our Exhibit at the Power Show, Nov. 30 to Dec. 5, Grand Central Palace, N. Y.

Our Mistake!
We ask your pardon—

SINCE our advertisement on the Barnes & Jones Condensator was published in this magazine last month we have had so many inquiries for our Condensators for use with other heating systems, already installed or about to be, that we are obliged to use this space this month to make clear the fact that we do not sell our Condensator, separately, for use with any other heating system than our own.

EVIDENTLY we failed to make this point clear. However, our error served to bring out the fact that engineers and heating contractors do have difficulty in securing a good condensator, and emphasized, too, just how important a good condensator is in a heating system.

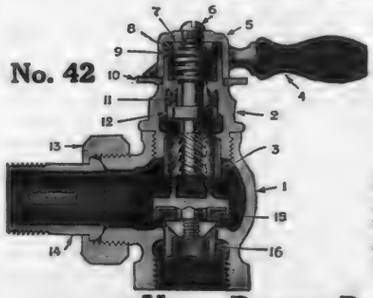
See Our Exhibit at the Power Show, Nov. 30 to Dec. 5, Grand Central Palace, N. Y.

Barnes & Jones

Vapor and Vacuum Heating Systems of Proven Quality

5 Melrose Street, Boston, Massachusetts **300 Madison Avenue, New York**

McALEAR SPECIALTIES FOR VAPOR HEATING SYSTEM



Packless Radiator Valves

Quick-opening, nickel-plated brass body. Fig. 38, angle pattern, wood wheel handle; Fig. 42, angle pattern, graduating type, lever handle.

Radiator Traps

Discharge air and water in large quantities. Close tight against steam. Noiseless in operation. Nos. 28 and 28-A of steam metal, furnished N. P. unless otherwise specified. Nos. 28-A and 29-A have right and left-hand discharge openings. Nos. 29, 29-A, 33, 34 and 36 have iron bodies and brass caps, furnished plain unless otherwise specified.

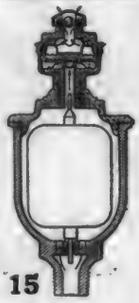
Vapor Damper Regulators

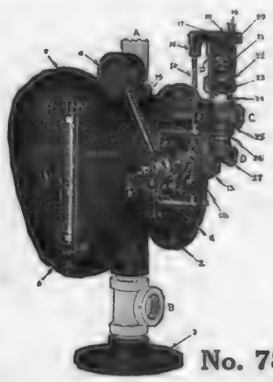
All metal, tapped for 1-inch steam pipe connection. Shipped complete with lever and two weights, S hooks, 2 ceiling pulleys and 12 feet of No. 10 plumbers' chain.

No. 56 for 0 to 3 pounds pressure, constructed with bellows of 10-inch flexible walls. No. 58 for 1 to 15 pounds pressure, constructed with bellows of 6-inch flexible walls.

Combination Float and Thermostatic Ball Check Valves

For venting supply and return mains of heating systems. These air valves close tight against water and steam, and by use of the check prevent the atmospheric pressure from entering the discharge opening.





Air Eliminator and Return Traps

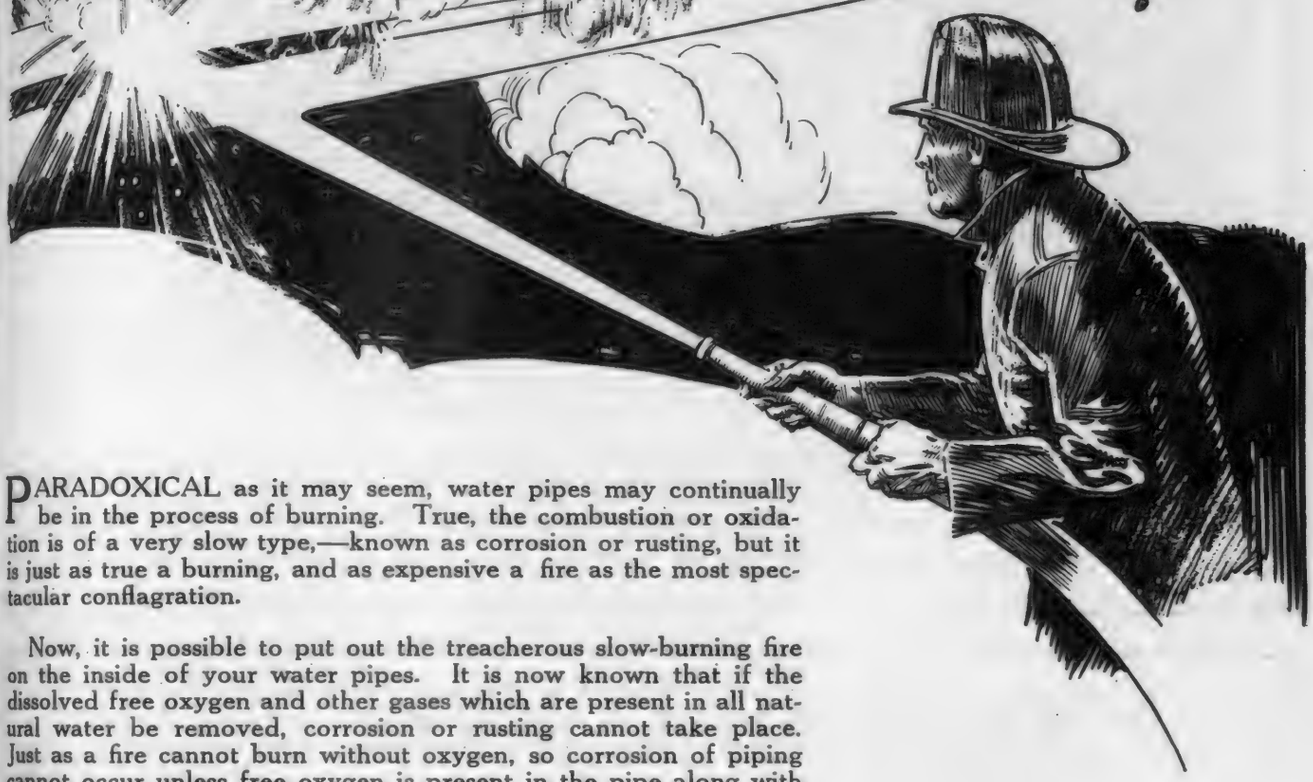
For automatically returning the water of condensation direct to boiler and discharging air. Minimum distance between water line of boiler and bottom of trap should be 18 inches. "A"—inlet to trap; "B"—discharge to boiler; "C"—steam connection to boiler; "D"—air vent.

THE McALEAR MFG. CO.

1901-7 S. Western Ave.

CHICAGO, ILL.

Put Out the Fire In Your Water Pipes!



PARADOXICAL as it may seem, water pipes may continually be in the process of burning. True, the combustion or oxidation is of a very slow type,—known as corrosion or rusting, but it is just as true a burning, and as expensive a fire as the most spectacular conflagration.

Now, it is possible to put out the treacherous slow-burning fire on the inside of your water pipes. It is now known that if the dissolved free oxygen and other gases which are present in all natural water be removed, corrosion or rusting cannot take place. Just as a fire cannot burn without oxygen, so corrosion of piping cannot occur unless free oxygen is present in the pipe along with the water.

Elliott Deaerators and Deactivators are showing in hundreds of buildings that corrosion can be stopped in a practical way, by removing the dissolved gases from the water before it enters the piping system. A further benefit is the removing of accumulated rust and corrosion products from the pipes by the action of the deaerated water.

Ask for our bulletin entitled "Water—But No Corrosion"

ELLIOTT COMPANY

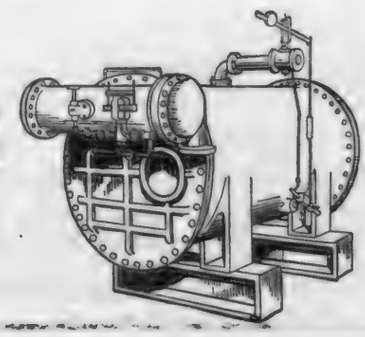
Pittsburgh, Pa.

General Sales Offices: Jeannette, Pa.

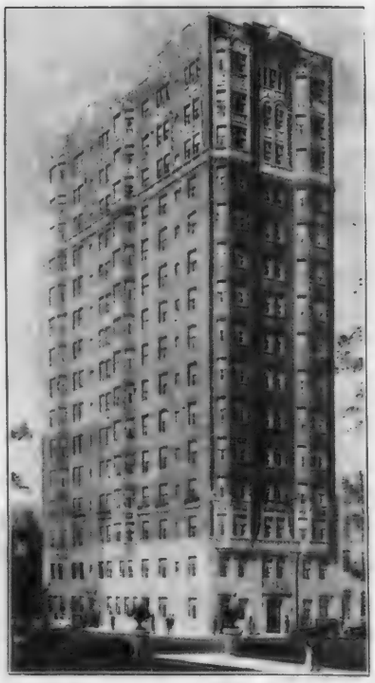
District Sales and Service Offices: Atlanta, Baltimore, Boston, Cincinnati, Cleveland, Chicago, Detroit, Kansas City, New York City, Philadelphia, Pittsburgh, and St. Louis

N-842

De-oxygen-ating Deactivators



Apparatus Deaerators



1900 Rittenhouse Sq., Philadelphia, Pa.

Over
200
Radiators
in this
beautiful
apartment
building
equipped
with

Sterlco-Roys Thermotrols

Write for Bulletin No. 38

STERLING ENGINEERING COMPANY

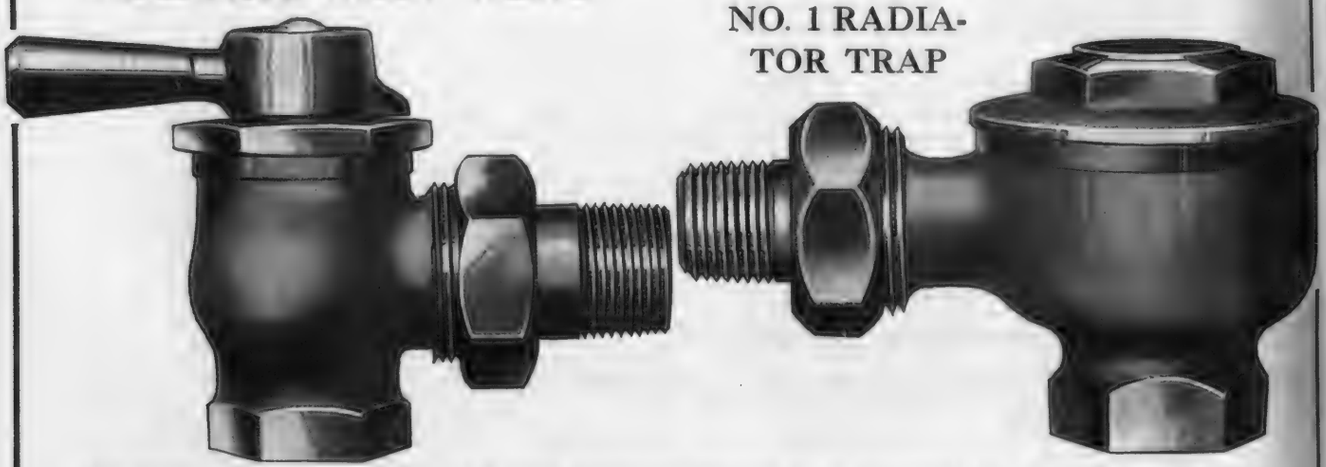
1626-1644 Holton Street, MILWAUKEE, WIS.

REPRESENTATIVES IN ALL LARGE CITIES

A WINNING COMBINATION

THERMOFLEX
GRADUATE INLET VALVE

THERMOFLEX
NO. 1 RADIA-
TOR TRAP



An attractive price makes this combination particularly adapted for hotels, office buildings and apartment houses. Why not send us an inquiry and let us tell you about them.

Thermoflex solves the perplexing problem of offset (right and left hand) and straightway traps with one body to do all three jobs. Send for catalog.

We have several desirable territories still open for representation. Write for our proposition.

W. D. CASHIN COMPANY

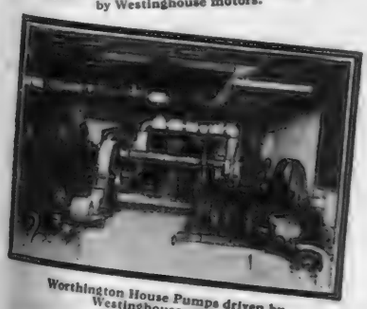
35 Hartford Street, Boston, Mass.

Westinghouse Serves In Chicago's Newest Terminal

Architects—Graham, Anderson, Probst & White, Chicago.
Builder—John Grffiths & Sons, Chicago.

Type SK Motor
Divide the Cost—by the Years They Last

American Carbonic Compressors driven by Westinghouse motors.



Worthington House Pumps driven by Westinghouse motors.

Sturtevant Fans in Ventilating System Driven by Westinghouse motors.

THE Chicago Union Station, just completed, represents the last word in modern railroad terminals, combining the most efficient method of serving the great traveling public with perfect comfort, convenience and safety.

Contributing in a large measure to the successful operation of this modern terminal, is the electrical building apparatus, designed and built by Westinghouse to meet the exact requirements of this particular service.

A Significant Fact

The fact that Westinghouse motors and control were specified for this terminal is significant of the confidence placed in Westinghouse equipment by men of keen judgment and responsibility.

This confidence will be rewarded by years of satisfactory service—so essential to the comfort and convenience of the traveling public.

Westinghouse Electric & Manufacturing Company
East Pittsburgh Pennsylvania
Sales Offices in All Principal Cities of
the United States and Foreign Countries

Westinghouse

X-82168

"—like driving an automobile by spurts and stops"

TWO kinds of control are obtained with thermostats used to regulate room temperatures; they are:

1. Positive, Snap-Action Control
2. GRADUAL Control

Which kind of control gives the most ACCURATE regulation? This question is answered in an able manner by N. W. Calvert and J. E. Seiter, in a paper published in the January, 1924, issue of the "Journal of American Society of Heating and Ventilating Engineers," in which they make the following statements:

". . . with individual thermostat control using the 'positive type' thermostat in which the controlled valve is either wide open or tightly closed, perfect regulation is difficult.

"When the temperature of the room reaches that set on the thermostat, the valve on the radiator closes. This radiator is still full of steam and the large weight of metal in the radiator itself is at a temperature between 212 and 230 degrees Fahr., and continues to radiate heat to the room. The occupant, becoming too warm, opens the window, thus cooling off the room sufficiently to cause the thermostat to open the radiator valve again.

"An intermediate (gradual) type thermostat, which will open the radiator valve only to a degree required by the need for heat in the room, is much to be preferred."

To operate heat controlling valves or dampers *wide open* and completely closed is obviously wrong. It is like driving an automobile by spurts and stops, alternately turning on and shutting off all of the power.

Only the Powers System Gives True GRADUAL Control

Only the Powers System of temperature control obtains true GRADUATED action, holding valves or dampers sufficiently open so that the necessary heat is steadily delivered to maintain the correct temperature.

In the Powers Thermostat the powerful Vapor Disc operates a double valve—controlling both supply and exhaust of the compressed air, thus acting as a reducing valve, giving just the air pressure required to correctly position the heat controlling valves and dampers.

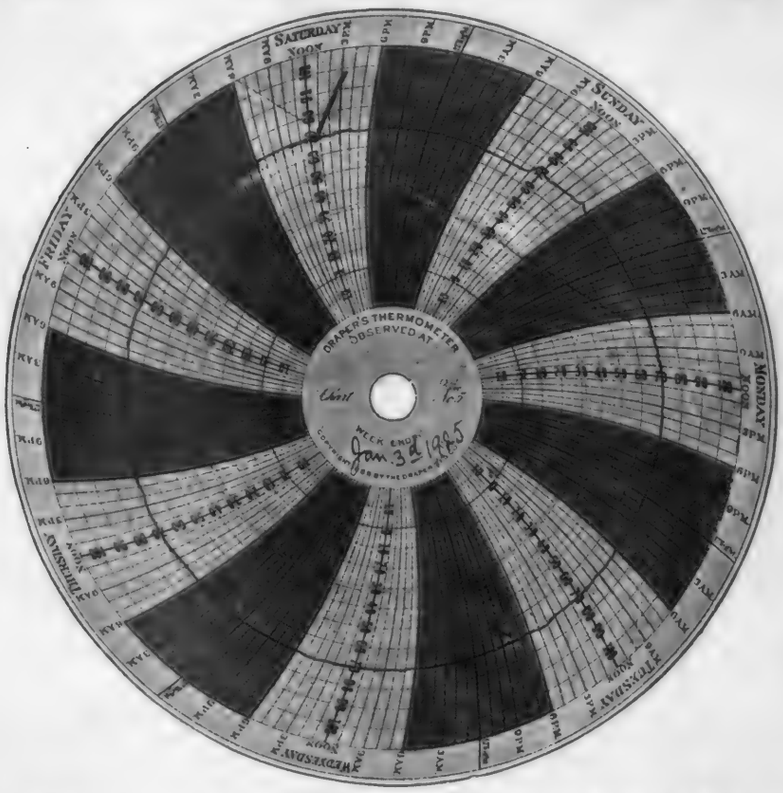
The Powers Type K Thermostat

Both the exhaust and supply cannot be open at one time—there is no continuous air waste. The valve or damper is positioned, then the air consumption

ceases until further change is required. Excessive use of air introduces large quantities of dust and moisture into a system with resulting clogging, and corrosion of air lines and mechanism. As the Powers System uses only five to ten per cent of the air required by other systems, it often gives ACCURATE and DEPENDABLE control for 15 to 25 years with practically no expense for adjustments or repairs.

Our book THE ELIMINATION OF HEAT WASTE shows why Powers control gives the most Accurate and Dependable service money can buy. May we send you a copy?

NOTE—Drop in temperature from Saturday to Sunday noon due to use of exhaust steam. Balance of time live steam was used.



Results Obtained with Powers GRADUAL Control

This chart came from the Barbour Flax Spinning Company. It records the temperature maintained by the Powers System of Automatic Temperature Control in the workrooms at their plant at Kearney, N. J. We shall be glad to work with engineers who want results like this for their clients.

THE POWERS REGULATOR COMPANY

34 years of specialization in temperature control

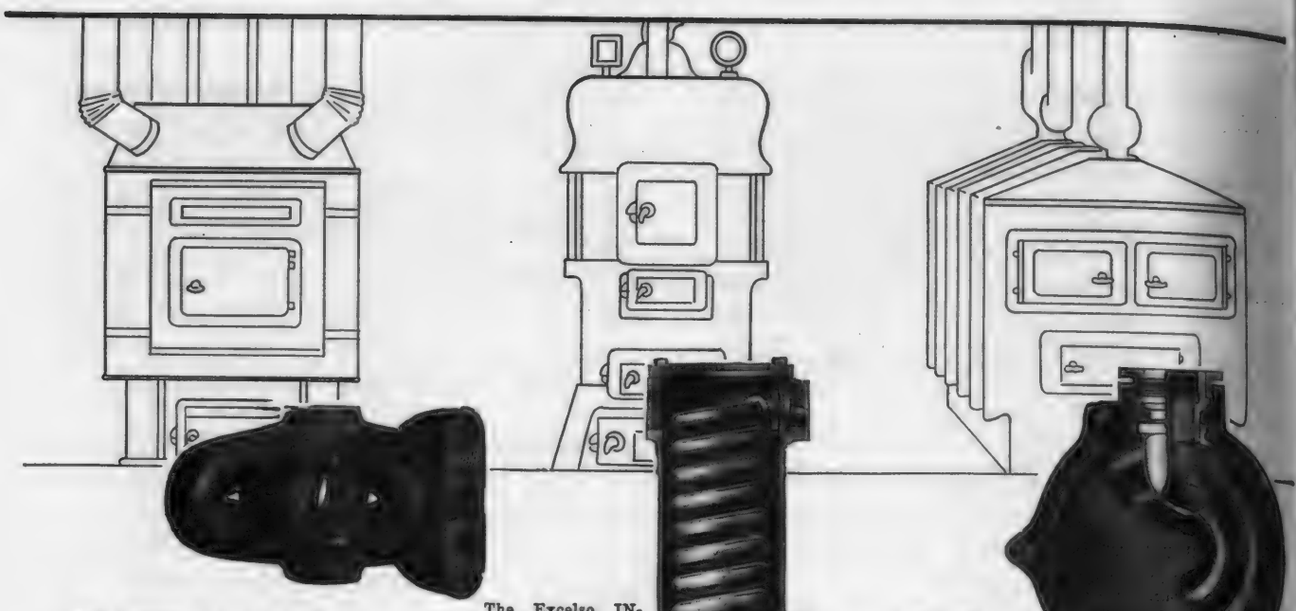
2718 Greenview Ave., Chicago

Atlanta, Baltimore, Boston, Buffalo, Butte, Mont., Charlotte, N. C., Cincinnati, Cleveland, Denver, Des Moines, Detroit, El Paso, Houston, Indianapolis, Kansas City, Los Angeles, Milwaukee, Minneapolis, Nashville, New Orleans, New York, Philadelphia, Pittsburgh, Rochester, St. Louis, San Francisco, Seattle

CANADIAN OFFICES

Toronto, Montreal, Halifax, Winnipeg, Calgary, Vancouver

(3340)



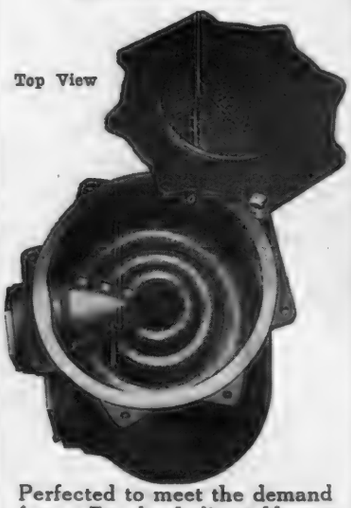
The Excelso PHAETON—for Warm Air and Hot Water Plants. Water heating capacities from 30 to 250 gallons. Water radiator heating from 40 to 400 sq. feet.

The Excelso INDIRECT—for Vapor and Steam Boilers. Single coil heaters from 30 to 120 gal. capacity.

Top View
The Excelso DOUBLE COIL—for Larger Steam and Vapor Boilers. Capacity from 160 to 400 gallons.

New Triple Coil Excelso Heater

Top View



Perfected to meet the demand for an Excelso Indirect Heater that will serve large buildings, hospitals, etc.
Hot water heating capacity
600 and 800 gals.
May also be connected in batteries for heating large quantities of hot water.

Excelso Method of Heating Water Now Adaptable to ANY Size of Heating Plant

Excelso engineers now offer Single, Double and Triple Coil Excelso Indirect Heaters so that you may specify "Excelso" on practically any tank size, connected to steam and vapor boilers.

The Excelso Phaeton and the Excelso Generator give the same abundant hot water service when installed in hot air or hot water plants—with all the disadvantages of fire pot pipe coils eliminated.

Excelso Hot Water Units are popular specifications. Have you a complete file of literature?

EXCELSO SPECIALTY WORKS, Inc. 59 Clyde Ave., Buffalo, N. Y.

DISTRICT REPRESENTATIVES:

210 E. 45th St.
New York, N. Y.

46 Cornhill
Boston, Mass.

5939 Haverford Ave.
Philadelphia, Pa.

NATIONALLY DISTRIBUTED BY LEADING JOBBERS AND BOILER AND RADIATOR MANUFACTURERS

EXCELSO WATER HEATERS

Sold by All Plumbers and Steamfitters

HANDON

Mr. Engineer and Mr. Steamfitter

Do you know why **HANDON** charcoal iron boiler and tank heater sales are increasing?

Because—

1. There is no **better boiler** sold **anywhere** at **any price.**
2. **A better** casting. Made of **charcoal iron.**
3. **Full** grate area.
4. **More** prime heating surface.
5. Steams **quickly** and **retains** heat.
6. Long fire travel.
7. **Excellent service.**
8. **Made right** by expert foundrymen.
9. **Time** and **money saved** in assembling; goes together **right.**
10. **A profitable boiler** for the trade; **absolute protection.**
11. Gives **complete** satisfaction to the house owner.
12. **Your customer** becomes a **Handon booster.**

If you have not yet used a Handon boiler, **why not try one and be convinced of the superior features we offer?**

If your jobber does not sell Handon boilers, send us his name.

HANDON BOILER CORPORATION

General Sales Office:

101 Park Avenue
NEW YORK CITY

Foundry:

Poughkeepsie, N. Y.

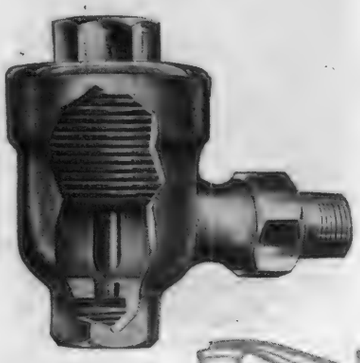
HANDON

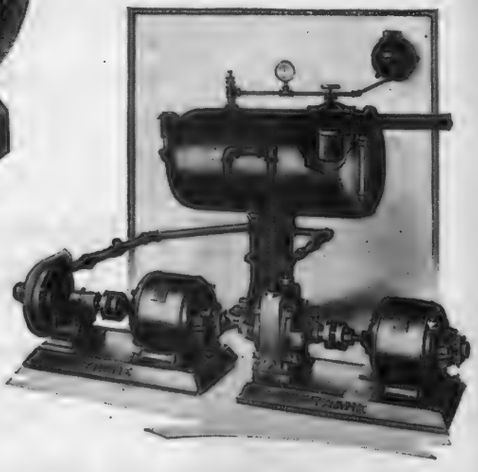
UNDIVIDED RESPONSIBILITY

BELLOWS PACKLESS VALVE+BELLOWS RADIATOR TRAP+VACUUM PUMP

The "Big Three" are backed by Trane

USE THEM TOGETHER





Trane Bellows Trap 14 corrugations. Bellows 1¾ inch in diameter. Brass body. Normal range 15-inch vacuum to 25 pounds pressure. Guaranteed 5 years. Described in Bulletin 14.

Trane Bellows Packless Valve Absolutely packless in every respect. Contains genuine Trane Bellows. Brass body. Indestructible handle. Described in Bulletin 14.

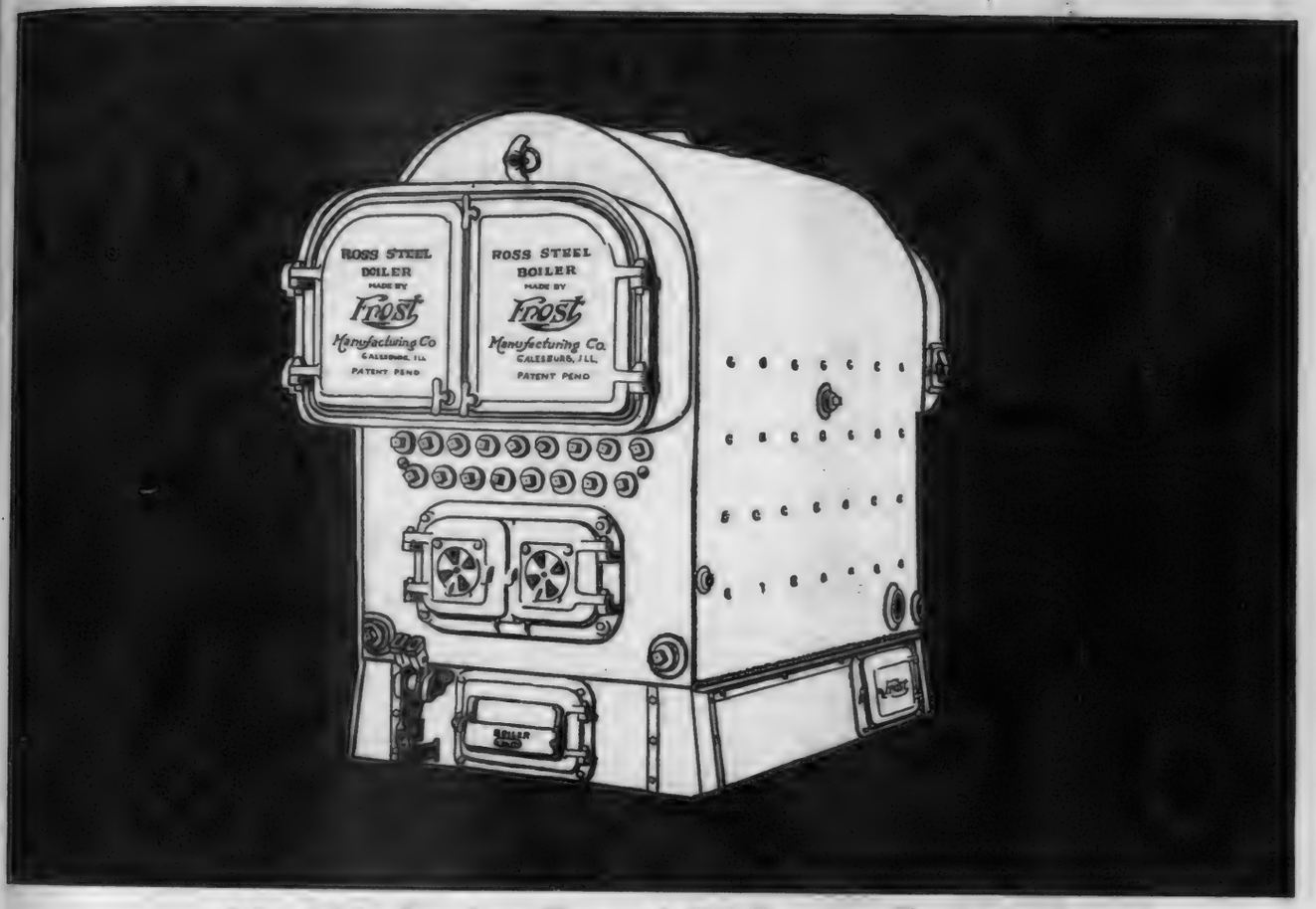
Trane Vacuum Pump Separate Case Construction. Single or two-motor drive. 350 combinations. Pedestal type tank with built-in strainer. Less motor horsepower for a guaranteed capacity than any other vacuum pump ever designed. Described in Bulletin 20.

Write for the Trane Bulletin Binder, describing the entire line of Trane Heating Specialties and Trane Pumping Equipment.

HEATING TRANE PRODUCTS PUMPING

THE TRANE COMPANY, 206 Cameron Ave., La Crosse, Wis. Manufacturers of vapor and vacuum heating specialties and pumps. Branches and sales connections at New York, Chicago, Boston, Philadelphia, Buffalo, Cleveland, Detroit, Seattle, Los Angeles, Albany, Minneapolis, Salt Lake City, Ft. Wayne, Portland, Ore., Greensboro, N. C., Zanesville, Ohio, Atlanta, Ga., Des Moines, Ia. In England: 22-23 Clerkenwell Close, London, E. C. 1. In Canada: The Trane Co., 23 River St., Toronto; Thomas Robertson & Co., 134 Craig St., West, Montreal; F. S. Murdoch, 310 Breadalbane, Winnipeg. In Japan: The Uchida Trading Co., Ltd., Tokio—Osaka—Kobe. In China: C. J. Doughty & Co., 7 Jinkee Road, Shanghai.

ROSS
STEEL HEATING BOILERS



Adaptable for Any Type of Oil Burning Equipment

The Owners' Admiration Increases

"I have been using a Ross Steam Boiler for two years and firmly believe that there is not a better boiler on the market today. My janitor claims it is the best one he has ever fired.

"It is easy to care for, as it requires very little attention and is very economical. I have been able to use a cheaper grade of coal and get far better results than with the other boiler."

"Have just completed the third winter with the Ross Boiler—when I remodeled my building the Ross Boiler was installed to replace another boiler and the improvement is remarkable. The Ross Boiler is carrying more radiation and takes up less room. It has also cut the coal bill in half and requires firing only twice a day during the cold weather."

CATALOG SENT ON REQUEST

The Frost Manufacturing Co.

Main Office and Works
Galesburg, Ill.

Established 1851

Chicago Sales Office
112 West Adams St.

Some of the Features of the EverHot AUTOMATIC WATER HEATER

1—Heating Surface.
2—Burner.
3—Thermostat.
4—Absence of Condensation.
5—Freedom from Liming.
6—Freedom from Trouble.

6—Freedom from Trouble

In five years we have never charged a cent for service or repairs. This is proof of our claim that the EverHot leads in freedom from trouble.

No other manufacturer of automatic water heaters has ever approached this record—but it is no burden for us. We cannot conceive of any more convincing evidence that the EverHot is the most trouble free automatic heater made.

If you have read the preceding articles of this series you will readily understand the reasons for the remarkable freedom from trouble with the EverHot.

Here they are in brief:

1. The heating element is a sturdy boiler no one of which has ever yet worn out.

2. The burner—(a big trouble maker in the old types) in the EverHot is almost wholly trouble free.

3. The simple graduated thermostat has been successfully used for over twenty-four years.

4. Absence of condensation which invariably causes trouble whenever it is present.

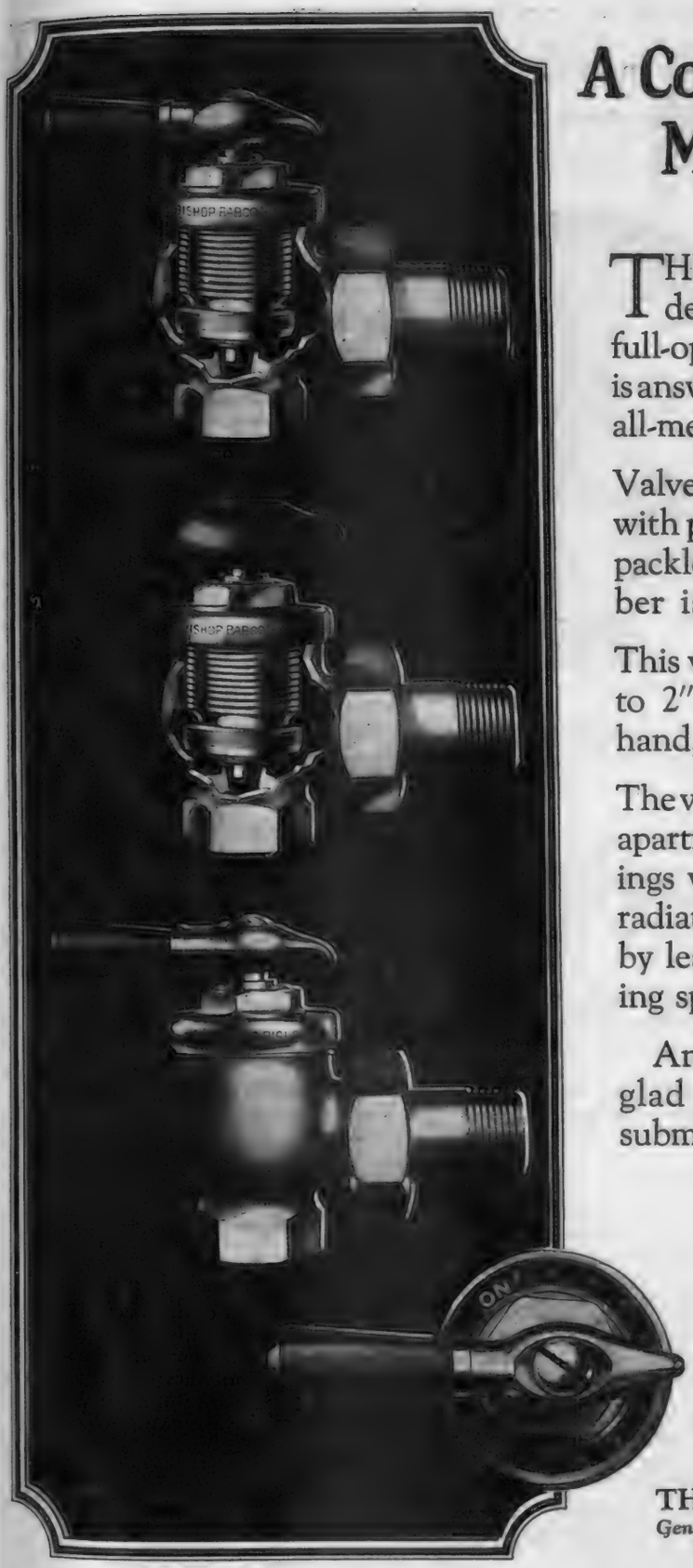
5. Freedom from liming because there are no restricted waterways in which temperature is uncontrolled.

Further evidence of merit lies in the fact that the EverHot type has been and is being imitated by other manufacturers. It will be imitated further, for the type is correct.

Prices
Baby Grand $66 — Junior $88 — Senior $139

EverHot Heater Company

5215 WESSON AVENUE **DETROIT, MICHIGAN**



A Companion for B&B Multiflex Traps

THE demand for a simple, compact design in a packless modulation or full-opening valve at a moderate price is answered with the Bishop & Babcock all-metal packless valves, bellows type.

Valve is made with a heavy brass body with polished trimmings and is entirely packless. The Multiflex bellows member is of one piece seamless brass.

This valve is made in all sizes from ½" to 2" and in angle, right hand, left hand, and straight way patterns.

The valve is ideal for residences, hotels, apartment buildings and office buildings where individual control of the radiator is desired. It is recommended by leading architects, engineers, heating specialists and contractors.

Any of our branch offices will be glad to supply full information or submit samples upon request.

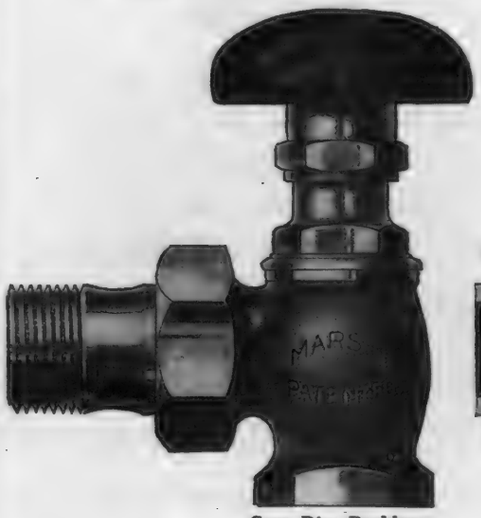
Distinctive Features:

Moving parts of special wear-resisting metal.
Large steam port, renewable Jenkins disc, full lift.
Packless, Multiflex bellows insures a steam and water tight valve.
Extra heavy swivel and nut.
All parts interchangeable.

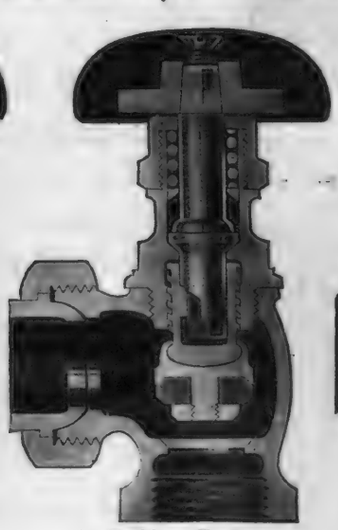
THE BISHOP & BABCOCK MFG. CO.
General Offices and Factories Cleveland, Ohio
Offices in Principal Cities

BISHOP & BABCOCK
HEATING SPECIALTIES

Marsh Cone Discs are without question the **greatest improvement** in radiator valve construction **in the past fifty years** or since the composition disc replacing the old style metal-to-metal disc and seat



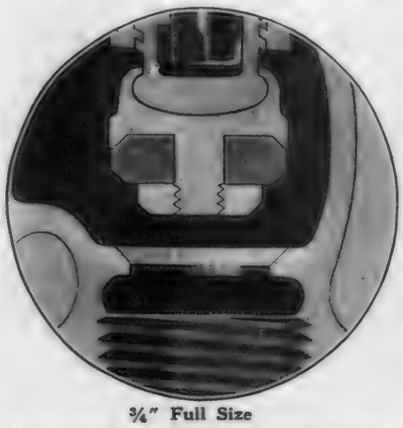
Cone Disc Packless
Fig. 141



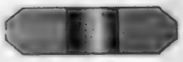
Packless Feature

Cone Disc Modulated
Fig. 147

This Cone Disc construction combined with the **Marsh Re-enforced Packless Feature** is the last word in completing radiator valve **maximum efficiency** at **popular prices,** all of which will check 100% true upon investigation.



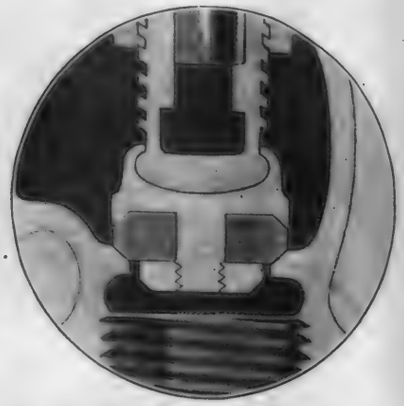
¾" Full Size



¾" Cone Disc

These Discs will not crack or leak through valve seat.

No clogging or water hammer from return condensation.



Positive Seal

The above views showing cone disc and beveled seat are to **actual size of a ¾" valve** and are made to full size to show the following advantages of this construction over the old style flat disc and seat:

FIRST: Through design of disc and protection afforded from disc nut covering under surface they will not warp and crack as will a flat disc which overhangs valve seat.

SECOND: The compression is at right angles to face of seat, forcing disc compound inward to center, making disc more compact and harder instead of scoring and extruding over seat, opening cracks or seams if any, as with a flat disc.

THIRD. While the life of these cone discs because of construction, as proven by tests, is three to five times the life of a flat disc, and a CRACKED DISC IS IMPOSSIBLE, the matter of exchange if desired is very simple, as to remove disc nut the disc will drop from dischoIder, while with a flat disc it must be dug out, often destroying dischoIder. Further, these cone discs are reversible and can be turned over or replaced with new at the same cost as for a flat disc.

FOURTH: The beveled seat is low in valve body, giving perfect drainage and will wash free from sand or scale in system, positively providing against leakage through scale or grit imbedding in disc AS IS COMMON with a raised flat seat and flat disc construction.

FIFTH: Through this low beveled seat, to return condensation through valve for a one-pipe system, the flow will hold to the outer wall leaving center of valve throat and pipe free rather than shoot out over a raised seat to the center of pipe as is common with a heavy flow over a flat seat, clogging flow of steam, causing hammer or pounding of system.

The above are all, each and every one, practical points which will prove out in test and practice. Positively a better valve at a less cost than can be had from any other source.

MARSH VALVE COMPANY - - Dunkirk, N. Y.

These Diagrams Illustrate Why

"A"

"B"

The Bayley Turbo Will Not Clog

Compare the two diagrams above: "A" represents an air washer of the multiple spray type; "B" the Bayley Turbo Air Washer. For a 10,000 C.F.M. capacity washer, the multiple nozzle type would require twenty-five 3/16" nozzles with 20 lbs. water pressure at each individual nozzle, while a Bayley Turbo requires only one 31/32" nozzle and only 8 lbs. water pressure.

The power saving alone should cause a preference for the Bayley, but this feature is still more important; note that the area of the nozzle opening in the Bayley, represented by the circle in "B," is 26.45 times the area of one of the small nozzle openings shown in "B." This large single nozzle opening in the Bayley means free flow of water with no possibility of clogging through collected dirt, while the tiny orifices of the multiple type washer may easily clog from entrained solids in the water.

Centrifugal Force Not High Pressure

In a Bayley Turbo Washer the water is delivered at nominal pressure, by a single large nozzle to a rotor or spray wheel where it is churned centrifugally through atomizing pins on the rotor into a dense even spray. The high pressure, multiple nozzle air washer, requires water at high pressure and the many fine orifice nozzles easily become clogged.

Saves Power and Expanse

Because the Bayley Turbo Washer atomizes the water by centifugal force and not high pressure, it requires only nominal water pressure for maximum effectiveness, which saves 40 to 60% of the power required to develop the high pressure necessary for the multiple spray system. It also saves the labor costs of cleaning clogged nozzles and pump screens with a resulting total saving in operating costs that is very much worth while.

Representative Installations

Waukesha Moor Mud Bath Co.,	Waukesha, Wis.
Medford Hotel,	Milwaukee, Wis.
Wausau Hotel,	Wausau, Wis.
Roosevelt High School,	Des Moines, Iowa
Mercy High School,	Chicago, Ill.
Grant Club,	Des Moines, Iowa
Middletown Ohio High School,	Middletown, Ohio
Gwynn Falls High School,	Baltimore, Md.
Saenger Amusement Co., Inc.,	Shreveport, La.

Most Efficient

Because it is so much improved over all existing types of air washers, etc. Bayley is more than an air washer—it is a mechanism for exact and positive control of the air supply, cooling, tempering, humidifying, or dehumidifying it as needed. It is the most positive in action, flexible in control, easily adjusted air conditioning apparatus available today. Write for Bulletin No. 25 giving the complete facts.

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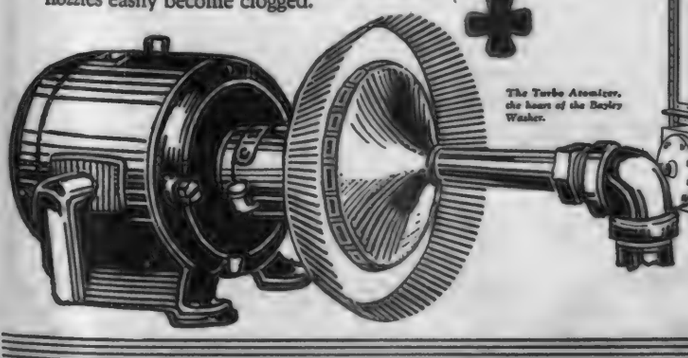
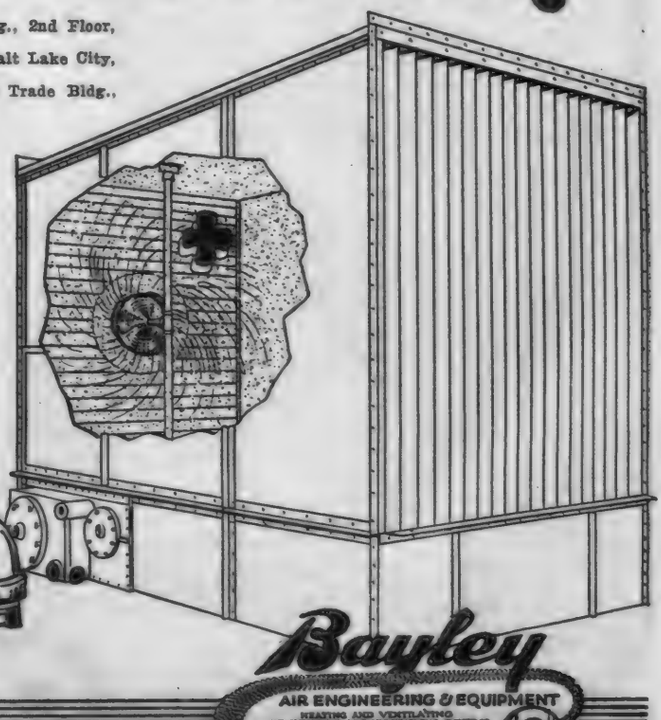
Will Not Clog

The Bayley Turbo Air Washer will not clog, needs no pump screen, and requires only nominal water pressure. It churns the water centrifugally into a dense even spray. The high pressure, multiple nozzle air washer requires water at high pressure, screened at the pump, and the fine orifice nozzles easily become clogged.



The Turbo Atomizer, the heart of the Bayley Washer.



Bayley

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HEATING AND VENTILATING
AIR WASHERS AND HUMIDIFYING SYSTEMS
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IN

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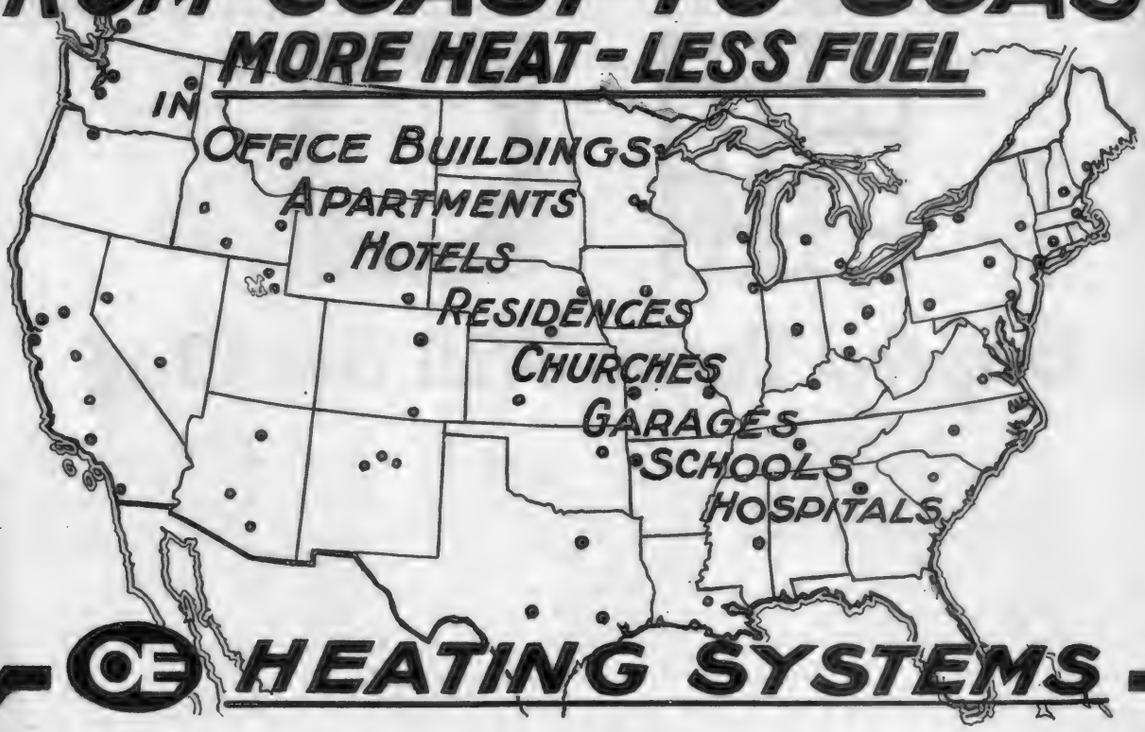
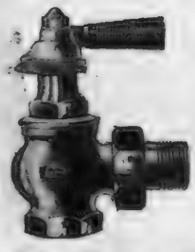
HOSPITALS



O-E HEATING SYSTEMS



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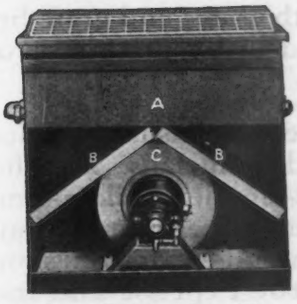

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B.—Air filter easily removable for cleaning.
C.—Cone type fan specially insulated for quiet operation.

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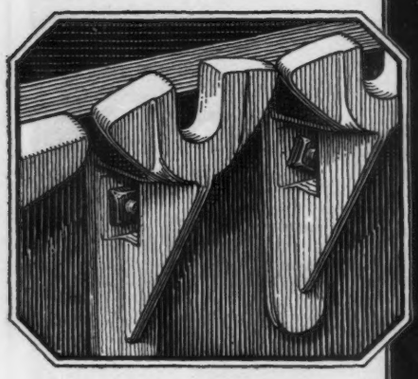
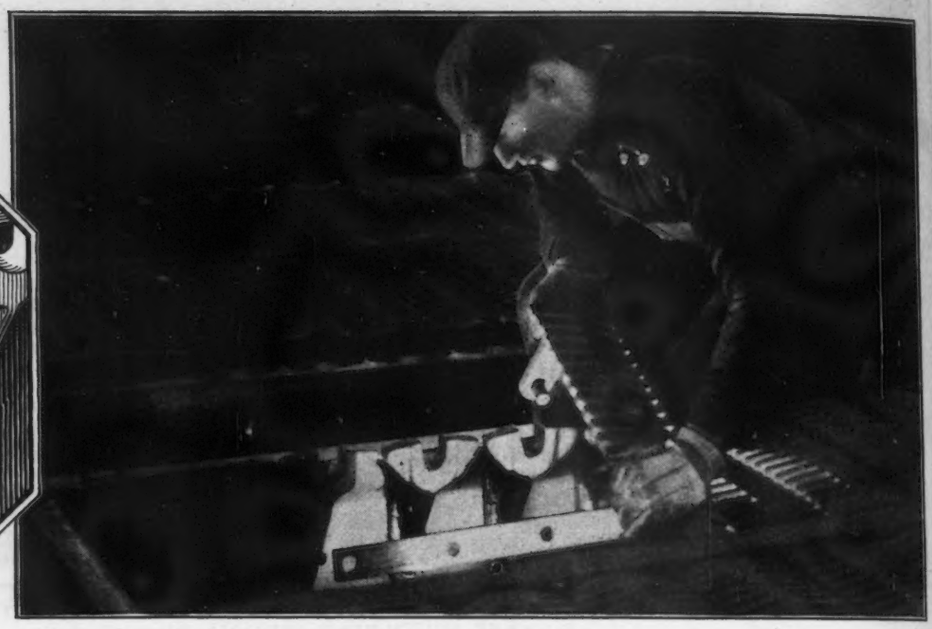
HEGGIE-SIMPLEX

[FORMERLY SIMPLEX]

ELECTRIC-WELDED STEEL BOILERS



Detail of Heggie-Simplex Individual Grate Brackets



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The Heggie-Simplex Boiler combines in one portable, electric-welded steel unit all the recognized advantages of both firebox and return tubular, double pass boilers. It has four distinctive features of fundamental importance:

1. **Extra large firebox and direct heating surface.**
2. **Secondary combustion chamber to provide ample room for complete combustion before entering flues.**
3. **"Rear-front-rear" passage for the gases.**
4. **A single, unimpeded, freely circulating body of water.**

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IN every Heggie-Simplex Boiler, both grates and grate brackets are of the finest gray iron—and every grate rests upon its own *individual brackets.*

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To the last detail, the Heggie-Simplex Boiler is designed and maufactured with this same care for the user's convenience. The single unit-construction of electric-welded steel simplifies installation. All flues are cleaned from the front. The fire door and ash pit door are large and conveniently placed. There are wash-out plugs at all four corners, a clean-out door at the rear of the base, as well as two in the smokebox.

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The Heating and Ventilating Magazine

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